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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—BULLETIN No. 61.

THE LAWS IN FORCE AGAINST INJURIOUS INSECTS AND FOUL BROOD IN THE UNITED STATES.

COMPILED BY

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L. O. HOWARD, Ph. D.,

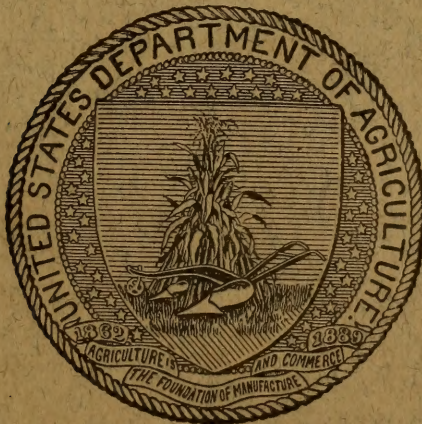
Entomologist and Chief of Bureau,

AND

A. F. BURGESS,

Secretary of the American Association of Horticultural Inspectors.

ISSUED NOVEMBER 5, 1906.



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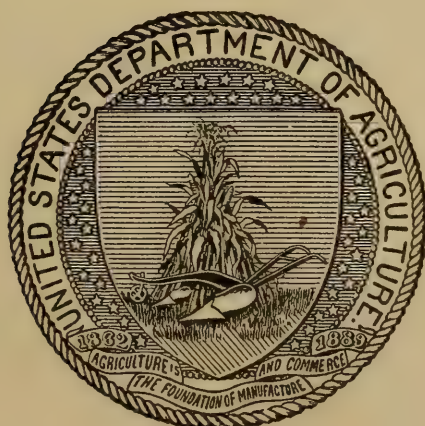
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., August 30, 1906.

SIR: I have the honor to submit for publication a compilation of the laws and regulations now in force against injurious insects in the different States and Territories of the Union, for the information of persons engaged in the trade of living plants, and of horticultural and agricultural associations. To the compilation proper is added a brief account of the preliminary and annual meetings of the American Association of Horticultural Inspectors from 1897 to 1905. I recommend that it be published as Bulletin No. 61 of the Bureau of Entomology.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

PREFACE.

In 1895 a bulletin of this same general character was published under the title of Bulletin No. 33 of the Division of Entomology. At that time the recently discovered occurrence of the San Jose scale in the East had already induced vigorous discussion at agricultural and horticultural societies and conventions on the desirability of State legislation in this direction. The bulletin in question was of service as indicating the desirable provisions of such laws and their proper form. In 1898 another bulletin covering the same ground was published under the serial number 13, new series, of the Division of Entomology. The publication of this new bulletin was necessitated by the enactment of new laws and the very active interest in the subject on the part of several States. Since 1898 other States have enacted laws, and the laws already in existence have been amended. The Chief of the Bureau had in mind the publication of still another bulletin bringing the subject down to date, and had begun its preparation. At a meeting of the American Association of Horticultural Inspectors, held in Washington, D. C., in November, 1905, a resolution was adopted asking the Department of Agriculture to prepare the compilation here submitted. The delay in the collection and arrangement of the laws has been necessitated by the lengthy correspondence involved, but to avoid the consequences of delay, on July 5 a brief summary was prepared by Mr. A. F. Burgess, secretary of the American Association of Horticultural Inspectors, and published under his authorship as Circular No. 75 of the Bureau of Entomology. In preparing the following compilation the writer has been greatly assisted by Mr. W. F. Tastet, of the Bureau force.

L. O. H.

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THE LAWS IN FORCE AGAINST INJURIOUS INSECTS AND FOUL BROOD IN THE UNITED STATES.

STATE AND TERRITORIAL LAWS AGAINST INJURIOUS INSECTS.

ALABAMA.

No. 559.

AN ACT to prevent and prohibit the importation of seed from cotton affected with Texas boll weevil.

SECTION 1. *Be it enacted by the legislature of Alabama*, That no person shall import or bring into the State of Alabama any seed from cotton affected with what is known as the Texas boll weevil, nor the seed from any place where the cotton has been affected with said boll weevil.

SEC. 2. Any person who violates the provisions of section 1 of this act shall be guilty of a misdemeanor, and, on conviction, shall be fined not less than ten dollars (\$10.00) and not more than five hundred dollars (\$500.00).

Approved Oct. 6, 1903.

No. 121. CODE OF 1903.

AN ACT to further protect horticulture, fruit growing, and truck gardening, and to exclude crop pests of all kinds in the State of Alabama.

SECTION 1. *Be it enacted by the legislature of Alabama*, That from and after the passage of this act the commissioner of agriculture and industries of the State of Alabama, the president of the Alabama State Horticultural Society, and the director of the experiment station of the Alabama Polytechnic Institute shall, ex officio, constitute a board to be known as the State board of horticulture, of which the commissioner of agriculture and industries shall be chairman, which board shall have full power to enact such rules and regulations governing the examination, certification, sale, transportation, and introduction of trees, shrubs, cuttings, buds, vines, bulbs, and roots as they may deem necessary to prevent the further introduction, increase, and dissemination of insect pests and plant diseases.

SEC. 2. That the professor of horticulture of the Alabama Polytechnic Institute shall act as State horticulturist and as secretary of said board of horticulture under the provisions of this act, and it shall be the duty of the said board to promulgate rules and regulations in accordance with this act for the government of the said State horticulturist in the duties devolving upon him in execution of the provisions of this act.

SEC. 3. There is hereby annually appropriated the sum of (\$1,500) fifteen hundred dollars, to be disbursed under the direction of the board of trustees of the Alabama Polytechnic Institute for the purpose of defraying the expense in the execution of this act.

SEC. 4. The State horticulturist or a deputy duly authorized by the board of

horticulture shall have power under the regulations of the board of horticulture to visit any section of the State where such pests are supposed to exist, and to determine whether any infested trees or plants are worthy of remedial treatment or shall be destroyed, and he shall immediately report his findings in writing, giving reasons therefor, to the owner of the infested plantation, his agents, or tenant, and a copy of each report shall also be submitted to the said board. In case of objections to the findings of the State horticulturist, or his deputy, an appeal shall be made to the said board, who shall have power to summon witnesses and hear testimony on oath, and whose decision shall be final. An appeal shall be taken within ten days and shall act as a stay of proceedings until it is heard and decided.

SEC. 5. Upon the findings of the State horticulturist or his deputy in any case of infested trees or plants, the treatment prescribed by him shall be executed at once (unless an appeal is taken), under his supervision. The cost of material and labor shall be borne by the owner: *Provided, however*, That in case the trees or plants shall be condemned they shall be destroyed by the State horticulturist, and the expense of such action shall be borne by the owner. No compensation shall be allowed for any plants that shall be destroyed.

SEC. 6. In case any person or persons refuse to execute the direction of the State horticulturist or of the said board upon an appeal, a justice of the peace or probate judge of the county shall, upon complaint filed by the State horticulturist or any freeholder, cite the person or persons to appear before him within ten days after notice being served, and that the said judge, upon satisfactory evidence, shall cause the prescribed treatment to be executed, and the expense thereof and cost of court shall be collected from the owner or owners of infested plants.

SEC. 7. It shall be unlawful to offer for sale, sell, give away, or transport perennial plants, scions, buds, trees, shrubs, vines, or other plants, tubers, roots, cuttings, bulbs, known to be infested with dangerously injurious insects or plant diseases. Any person or persons violating this section shall, upon conviction, be fined not less than ten nor more than one hundred dollars for each separate offense.

SEC. 8. The said board of horticulture, its agents, or employes, are hereby empowered with authority to enter upon any premises in discharge of the duties herein described. Any person or persons who shall obstruct or hinder them or their agents in the discharge of these duties shall be deemed guilty of a misdemeanor, and, upon conviction therefor, shall be fined not less than ten nor more than one hundred dollars.

SEC. 9. The board shall have the power also to adopt rules and regulations, not inconsistent with the laws and constitution of this State and the United States, for preventing the introduction of dangerously injurious crop pests of all kinds from without the State or regarding the dissemination of crop pests within the State, and for the governing of common carriers in transporting plants liable to harbor such pests, to and from and within the State, and such regulations shall have the force of laws.

SEC. 10. *Be it further enacted*, That the members of said board, any two of whom shall constitute a quorum, in the absence of the third, shall, within thirty days of the passage of this act, and from time to time, draw up and promulgate through the press of the State the rules and regulations necessary to carry into full and complete effect the provisions of this act, carefully defining what diseases or maladies, both insect and fungus, shall constitute infection in trees or plants within the meaning and purview thereof.

SEC. 11. It shall be unlawful for any person, firm, or corporation to sell, give away, or ship within the State of Alabama any trees or shrubs or any other

plants commonly known as nursery stock, without having a certificate of guarantee of the State horticulturist of Alabama. A copy of such certificate of guarantee must accompany each box or package sold, given away, or shipped. Such certificate must be dated within twelve months. If upon examination such stock is found to conform to the requirements of the said board of horticulture, the State horticulturist must furnish a certificate to that effect. Any person or persons selling, giving away, or shipping nursery stock without the certificate of the State horticulturist shall be fined not less than fifty nor more than one hundred dollars.

SEC. 12. Each and every person, firm, or corporation residing and doing business outside of the State of Alabama, dealing in or handling trees, shrubs, or other plants commonly known as nursery stock, shall file a copy of his or its certificate of his or its inspection furnished by the State horticulturist, nursery inspector, or other duly authorized official of his or its State or county with the secretary of the board of horticulture. Upon the filing of this certificate as above prescribed, and upon request of the person, firm, or corporation, a certificate will be issued to the same, and official tags bearing copy of such certificate and seal of the board will be furnished the same at cost: *Provided, however,* That the aforesaid certificate of inspection shall be adjudged satisfactory by the board. Each box, bundle, or package of nursery stock shipped into Alabama by any person, firm, or corporation shall bear one of these tags, and shipments of stock not thus tagged shall be liable to confiscation by the board of horticulture through its agents or employes.

SEC. 13. No transportation company or common carrier shall deliver any box, bundle, or package of trees, shrubs, or plants commonly known as nursery stock to any consignee residing within the State of Alabama when said box, bundle, or package does not bear the official tag or certificate of guarantee issued by the State horticulturist without previously notifying the State horticulturist of the particulars of the shipment as they may be required by the board, nor without duly warning the consignee of his risk in accepting said shipment. Failure on the part of any transportation company or common carrier to conform to these requirements shall be deemed a misdemeanor, and shall be punishable in each instance by a fine of not less than ten nor more than fifty dollars: *Provided,* That no common carrier shall be liable for damages to the consignee or consignor for refusing to receive, transport, or deliver such trees, packages, or boxes, when not accompanied by the tag or certificate herein provided.

SEC. 14. Any person, firm, or corporation receiving from any other firm, or corporation, any box, bundle, or package of trees, shrubs, or plants commonly known as nursery stock, which is not accompanied by a certificate of guarantee, or official tag issued by the State horticulturist to cover said stock, shall be deemed guilty of a misdemeanor, and, upon conviction, shall be fined not less than ten nor more than one hundred dollars.

SEC. 15. It shall be the duty of the State horticulturist to make a quarterly report of his work, and of the expenditures under this act to the board of horticulture, and said board shall report annually to the governor of the State.

Approved March 5, 1903.

The board of horticulture met at Auburn, March 20, 1903, and in accordance with section 10 of the above act, the following insects and fungous diseases were considered dangerous and to constitute infestation in trees and plants:

- (1) San Jose scale (*Aspidiotus perniciosus*).
- (2) The new peach scale (*Diaspis amygdali*).

When found in a nursery all infested stock to be burned. If San Jose scale is found in the immediate neighborhood, all stock must be fumigated or certificate will be withheld.

(3) Black knot (*Plowrightia morbosa*).

(4) Crown gall (*Dendrophagus globosus*).

When found in a nursery all diseased stock to be destroyed, otherwise stock may be shipped.

(5) Peach yellows.

(6) Peach and plum rosette.

All infested trees and nursery stock to be destroyed.

(7) Woolly aphis (*Schizoneura lanigera*).

All badly diseased stock to be destroyed. Other stock to be fumigated or treated with kerosene emulsion.

The following rules and regulations were adopted:

RULES AND REGULATIONS.

RULE 1. The State horticulturist is hereby charged with the enforcement of this act, and is directed to locate by personal visits, by correspondence, or in such other manner as he may deem best, to locate the above-named pests, so far as they exist in this State, and to take such action, in accordance with the above act, as he may deem necessary to control or eradicate the same.

RULE 2. The State horticulturist shall have power to require all nursery stock sold within the State of Alabama to be treated with hydrocyanic-acid gas, when in his judgment the presence of any pest requires it, for the better protection of the interests of the citizens of the State. Upon the failure of any individual, firm, or corporation to comply with this, the State horticulturist is hereby authorized to withhold his certificate.

RULE 3. All certificates of examination shall expire prior to July 15 of the year after date of issue.

RULE 4. All nurseries are to be examined between July 15 and November 15 of each year.

RULE 5. *Definition of "nursery stock."*—In addition to fruit trees, the following, if offered for sale, are classed as nursery stock, and are subject to the regulations governing the examination and transportation of the same: Strawberry plants, vines, ornamental trees, and shrubs.

RULE 6. All appeals from the decisions of the State horticulturist should be addressed to the chairman of the board of horticulture, at the capitol, Montgomery, Ala.

RULE 7. All communications relative to the examination of orchards and nurseries should be addressed to the State horticulturist, Auburn, Ala.

RULE 8. A deputy duly authorized by the board of horticulture shall have the same power and authority as the State horticulturist in carrying out the provisions of this act under the direction of the State horticulturist.

ARIZONA.

"Entomologically lawless," on authority of Prof. R. H. Forbes, Tucson, Ariz.

ARKANSAS.

Be it enacted by the general assembly of the State of Arkansas:

SECTION 1. Whenever any trees, vines, bushes, scions, cuttings, buds, or any nursery stock are shipped into this State from another State, county, or province, every package or quantity thereof shall be plainly labeled on the outside with the name and address of the consignor, the name and address of the consignee, the contents, and a certificate showing that the contents have been inspected by a State or experiment station entomologist of the State from which the shipment was made; that the trees, vines, bushes, scions, cuttings, buds, or other nursery stock therein contained are free from San Jose scale, peach yellows, rosette, or other dangerously injurious insects, or contagious or infectious fungoid or other diseases, and whenever any trees, vines, bushes, scions, buds, cuttings, or other nursery stock is shipped into the State without such certificate plainly fixed on the outside of the package, box, or car containing the same, the fact must be reported to the consignor by the railway company or express company, or other person or persons, corporations, or companies carrying the same, and said package, box, or car, or quantity thereof shall not be delivered to the consignee until the same shall bear the aforesaid certificate; and any railroad company, steamboat company, or express company, person or persons, corporation or company who shall violate or evade the provisions of this section, or offer any hindrance to the carrying out of this act, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than one hundred dollars, nor more than five hundred dollars, and such fine shall go into the general school fund of the State of Arkansas.

SEC. 2. That the entomologist of the experiment station of the university at Fayetteville be, and he is hereby, made the State inspector for the State of Arkansas, and he shall, when requested to do so by owners of nursery stock grown in this State, such as described in section one of this act, visit and inspect said nursery, and if found to be free from all insects, contagious or infectious fungoids or other diseases, he shall issue certificates of inspection in accordance herewith; said inspector shall receive as fees for said inspection five dollars for each fifty acres or fraction thereof, and all traveling expenses to be paid by those having the stock inspected, it being the intention of this act to provide an inspection of nursery stock grown in the State of Arkansas, so that the same may be inspected so as to enable them to ship to other States, and this act is to conform to other State laws.

SEC. 3. This act to take effect from and after its passage; all laws and parts of laws in conflict herewith are hereby repealed.

Approved May 20, 1903.

CALIFORNIA.

STATE COMMISSION OF HORTICULTURE.

AN ACT to create a State commission of horticulture.

[Approved March 25, 1903. Amended March 20, 1905.]

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. The office of State commissioner of horticulture of California is hereby created. It shall be the duty of the governor, within forty days after

the passage of this act, to appoint a citizen and resident of this State to hold said office of State commissioner of horticulture, who must at the date of his appointment be a skilled horticulturist and entomologist. The term of office shall be for four years and until a successor is appointed and qualified. The governor may remove such commissioner from office at any time upon filing with the secretary of state a certificate of removal signed by the governor. In case of a vacancy in said office by death, resignation, removal from office, or other cause, the governor shall fill the vacancy for the unexpired term. The salary of said commissioner shall be two hundred and fifty dollars per month, and he shall be allowed in addition a sum not to exceed five hundred dollars yearly for traveling and incidental expenses necessary in the discharge of his duties herein provided for. Such commissioner may appoint a secretary, who shall be versed in horticulture and entomology, and who shall be an experienced compiler of reports, bulletins, and such publications as may issue from said commission from time to time, and who shall perform all such duties as may be required of him by such commissioner. Such secretary of the horticultural commissioner shall receive a salary of twenty-one hundred dollars per annum. In appointing such commissioner and his successor or successors it shall be the duty of the governor to disregard political affiliations and to be guided in his selection entirely by the professional and moral qualifications of the person so selected for the performance of the duties of said office. The office of said commissioner shall be kept open every day except holidays and shall be in charge of the secretary during the absence of such commissioner. The main office of such commissioner shall be at the city of Sacramento. The secretary of state shall furnish and set aside in the capitol a room or rooms suitable for offices for said commissioner, and if the secretary of state shall make and file an affidavit with the said commissioner stating that it is not possible for him, as such secretary of state, to provide and set aside an office for said commissioner in the capitol or in any State building under his control, because there is no such office room or rooms available, then, and after the making and delivery of such affidavit to such commissioner, the said commissioner may rent rooms convenient and suitable for his offices under this act at a rental not to exceed five hundred dollars per year. Said commissioner may also keep and maintain an office in the city and county of San Francisco at a yearly rental not to exceed the sum of five hundred dollars, and may appoint a deputy commissioner, who shall be an expert entomologist and horticulturist, to have charge of said office under said commissioner, and to perform any and all duties which said commissioner may require of him under this act and shall fix the monthly compensation of such deputy at \$200 per month. Such deputy shall hold his position during the pleasure of such commissioner and may be removed from his office or position at any time by said commissioner filing with the secretary of state a certificate signed by said commissioner so removing such deputy. Said commissioner may also appoint, by and with the approval of the governor, such temporary deputies from time to time as may be required for quarantine purposes under this act, and such temporary deputies shall receive such compensation per diem as may be specified in the writing so approving such appointment. If there be not sufficient furniture and office appliances turned over to such commissioner by the State board of horticulture heretofore existing to furnish and equip properly the office or offices for such commissioner at Sacramento and San Francisco aforesaid, the said commissioner may, by and with the approval of the governor, purchase for the use of his said office or offices such furniture and appliances as may be necessary therefor, and from time to time, at an expense not to exceed a sum to be mentioned in such approval,

which expense, together with all other expenses authorized by this act, is hereby allowed for the purposes specified. [As amended March 20, 1905.]

SEC. 2. Upon taking office under this act such commissioner shall be entitled to receive and have turned over to him as such commissioner all the books, records, and property in the possession, charge, custody, or control of the State board of horticulture heretofore existing, and all such property shall be delivered to such commissioner upon demand. Such commissioner shall be deemed for such purposes the successor of said board.

SEC. 3. Such commissioner shall collect books, pamphlets, and periodicals and other documents containing information relating to horticulture, and shall preserve the same; collect statistics and other information showing the actual condition and progress of horticulture in this State and elsewhere; correspond with horticultural societies, colleges, and schools, and with the county boards of horticulture existing or that may exist in this State, and with all other persons necessary to secure the best results to horticulture in this State. He shall require reports from county boards of horticulture in this State, and may print the same or any part thereof as he may select, either in the form of bulletins or in his annual report, or both, as he shall deem proper. He shall issue and cause to be printed and distributed to county boards of horticulture in this State, and to all other persons whom he may deem proper, bulletins or statements containing all the information best adapted to promote the interest and protect the business and development of horticulture in this State. Such commissioner shall be deemed to be the State horticultural quarantine officer mentioned in chapter seventy-six of the laws of eighteen hundred and ninety-nine, for the purpose of that act, and shall be empowered to perform the duties which under that act are to be performed by the State horticultural quarantine officer: *Provided*, That any inspection therein authorized, when made by such commissioner, must be with the approval of the governor and as provided by this act.

SEC. 4. Said commissioner may, by and with the approval of the governor, establish, maintain, and enforce such quarantine regulations as may be deemed necessary to protect the nurseries, trees, shrubs, plants, vines, cuttings, grafts, scions, buds, fruit pits, fruit, vegetables, or other articles of horticulture, against contagion or infection by injurious disease, insects, or pests, by establishing such quarantine at the boundaries of this State or elsewhere within the State, and he may make and enforce, with the approval of the governor, any and all such rules and regulations as may be deemed necessary to prevent any infected stock, tree, shrub, plant, vine, cutting, graft, scion, bud, fruit pit, fruit, vegetable, or other article of horticulture from passing over any quarantine line established and proclaimed pursuant to this act, and all such articles shall, during the maintenance of such quarantine, be inspected by such commissioner or by a deputy appointed in writing by said commissioner, with the approval of the governor, and he or the deputy so conducting such inspection shall not permit any such article to pass over such a quarantine line during such quarantine, except upon a certificate of inspection signed by such commissioner or in his name by such a deputy who has made such inspection, unless such article has been immediately prior to such passage inspected by an officer or agent of the United States entitled to inspect the same, and such officer or agent has granted permission for such passage. All approvals by the governor given or made pursuant to this act shall be in writing and signed by the governor in duplicate, and one copy thereof shall be filed in the office of the secretary of state, and the other in the office of said commissioner before such approval shall take effect.

SEC. 5. Upon information received by such commissioner of the existence of any infectious disease, insect, or pest dangerous to any such article or to the

interest of horticulture within this State, or that there is a probability of the introduction of any such infectious disease, insect, or pest into this State or across the boundaries thereof, he shall proceed to thoroughly investigate the same, and may, by and with the approval of the governor, establish, maintain, and enforce quarantine as hereinbefore provided, with such regulations as may be necessary to circumscribe and exterminate or eradicate such infectious diseases, insects, or pests, and prevent the extension thereof, and is hereby authorized to enter upon any grounds or premises, and inspect any stock, tree, shrub, plant, vine, cutting, graft, scion, bud, fruit pit, fruit, vegetable, or other article of horticulture, or implement thereof, or box or package pertaining thereto or connected therewith, or that has been used in packing, shipping, or handling the same, and to open any such package, and generally to do, with the least injury possible under the conditions to property or business, all acts and things necessary to carry out the provisions of this act.

SEC. 6. Upon the discovery of any such infectious disease, insects, or pests, such commissioner shall immediately report the same to all county boards of horticulture, together with a statement as to the best-known means or method for circumscribing, exterminating, or eradicating the same, and shall state therein specifically what treatment or method should be applied in each case, as the matter may require, with a detailed statement or prescription as to the method of making or procuring, and of applying any preparation or treatment so recommended therefor, and the times and duration for such treatment, and if chemicals or articles be required other than those usually obtainable at any town, the place or places where they are most readily to be obtained; and upon the receipt of such statement by any county board of horticulture, or any member thereof, it shall be the duty of such county board of horticulture to distribute such statement in printed form to every person owning or having charge or possession of any orchard, nursery stock, tree, shrub, or article of horticulture within their county where it is supposed by said county board there is any danger to the interests of horticulture, and such a statement must be served with or be a part of the notice to be given to the owner or owners, or person or persons, in possession of any orchard, nursery, tree, shrub, or article of horticulture, referred to, provided for, and required to be served in and by section two of chapter one hundred and eighty-three of the laws of eighteen hundred and ninety-seven, or any amendments which have been or may be made thereto.

SEC. 7. Whenever it shall become necessary to establish quarantine under this act, if there be any authorities or officers of the United States having authority to act in such matter, or any part thereof, the said State commissioner of horticulture shall notify such authority or officers of the United States, and coöperate as far as possible with such authorities or officers of the United States wheresoever the jurisdiction of the United States extends and is being exercised, and shall obtain, whenever desirable and possible, the assent of the proper authority or officers of the United States to the establishment or change of quarantine lines, so as to most effectively and speedily accomplish the purposes of this act. The said commissioner shall at once notify the governor of all quarantine lines established under or pursuant to this act, and if the governor approve or shall have approved of the same or any portion thereof, the governor shall issue his proclamation proclaiming the boundaries of such quarantine, and the nature thereof, and the orders, rules, or regulations prescribed for the maintenance and enforcement of the same, and shall publish such proclamation in such manner as he may deem expedient to give proper notice thereof.

SEC. 8. The said State commissioner shall be *ex officio* a member of all county boards of horticulture existing or that may be created or exist in this State

pursuant to law, whenever he is present and acting with said county board within the county, where such county board exists, but when he is not so present in such county, acting with such county board, then the said county board shall have all the power and authority conferred on it by law, and may exercise such power by the action of the members of such county board or a majority thereof. The reports which county boards of horticulture are required by law to make, or which they may desire to make, shall, after the passage of this act, be made to the State commissioner of horticulture.

SEC. 9. It shall be the duty of the superintendent of State printing to print and deliver to the State commissioner of horticulture, upon the written request of said commissioner, all such bulletins, orders, rules, regulations, statements, reports, and other printed matter, as the said commissioner may deem necessary to have and use for carrying out the purposes of this act, and it shall be the duty of the secretary of state to cause to be prepared and furnished to such State commissioner all stationery, paper, blank forms, envelopes, and writing material needful and convenient for use in the office of such commissioner.

SEC. 10. It shall be the duty of said State commissioner to report in the month of January in each even-numbered year to the governor, and in each odd-numbered year to the legislature of this State, such matters as he may deem expedient or as may be required either by the governor or legislature, and to include a statement of all the persons employed, and of moneys expended under this act, by itemized statement thereof.

SEC. 11. Any person willfully refusing to comply with orders lawfully made under and pursuant to this act shall be guilty of a misdemeanor, and upon conviction shall be fined not to exceed five hundred dollars.

SEC. 12. All moneys paid under this act shall be paid by the State treasurer from moneys appropriated for the support of the State commissioner of horticulture, and expenses other than the salary of the commissioner, the compensation of his clerk and deputy commissioner, as allowed and provided by this act, must be certified by the said commissioner and be approved by the State board of examiners before being audited or paid. Any moneys remaining of any appropriation heretofore made or that may be appropriated for the use or support of the State board of horticulture are hereby appropriated to the support of the State commission of horticulture, and are directed to be applied to the payment of claims and expenses under this act.

SEC. 13. The sum of four thousand dollars is hereby appropriated for the use and support and to pay the expenses of the State commission of horticulture, for the fiscal years commencing July first, nineteen hundred and three, and July first, nineteen hundred and four, under this act.

SEC. 14. Chapter sixty-three of the laws of eighteen hundred and eighty-three, chapter seven of the laws of eighteen hundred and eighty-five, chapter eighty-six of the laws of eighteen hundred and eighty-nine, and chapter one hundred and ninety-four of the laws of eighteen hundred and ninety-one, are hereby repealed.

SEC. 15. This act shall take effect immediately.

COUNTY BOARDS OF HORTICULTURE.

[Following is the State law providing for the appointment of county boards of horticulture, prescribing their duties and defining their powers, as amended by the last legislature and approved March 20, 1905:]

SECTION 1. Whenever a petition is presented to the board of supervisors of any county, and signed by twenty-five or more persons, each of whom is a resident freeholder and possessor of an orchard, stating that certain or all orchards, or nurseries, or trees or plants of any variety are infested with any serious infectious diseases, or scale insects of any kind, injurious to fruit, fruit trees, vines, or other plants or vegetables, or that there is growing therein the Russian thistle or salt wort (*Salsoli kali*, variety *tragus*), or other noxious weeds, codlin moth, or other insects that are destructive to trees, and praying that a commission appointed by them, whose duty it shall be to supervise the destruction of said scale insects, diseases or Russian thistle or salt wort, or other noxious weeds as herein provided, the board of supervisors shall, within twenty days thereafter, appoint a board of horticultural commissioners, consisting of three members, who shall be qualified for the duties of horticultural commissioner. Upon the petition of twenty-five resident freeholders and possessors of an orchard, the board of supervisors may remove any of said commissioners for cause, after a hearing of the petition.

SEC. 2. It shall be the duty of the county board of horticultural commissioners in each county, whenever it shall deem it necessary, to cause an inspection to be made of any premises, orchards, or nursery, or trees, plants, vegetables, vines, or fruits, or any fruit-packing house, storeroom, salesroom, or any other place or articles in their jurisdiction, and if found infested with infectious diseases, scale insects, or codlin moth, or other pests injurious to fruit, plants, vegetables, trees, or vines, or with their eggs or larvæ, or if there is found growing thereon the Russian thistle or salt wort, or other noxious weeds, they shall notify the owner or owners, or person or persons in charge, or in possession of the said places or orchards, or nurseries, or trees, or plants, vegetables, vines, or fruit, or article as aforesaid that the same are infested with said diseases, insects, or other pests, or any of them, or their eggs or larvæ, or that the Russian thistle or salt wort or other noxious weeds is growing thereon, and they shall require such person or persons to eradicate or destroy the said insects, or other pests, or their eggs or larvæ, or Russian thistle or salt wort, or other noxious weeds within a certain time to be specified. Said notices may be served upon the person or persons, or either of them owning or having charge, or having possession of such infested place, or orchard, or nursery, or trees, plants, vegetables, vines, or fruit, or articles, as aforesaid, or premises where the Russian thistle or salt wort or other noxious weeds shall be growing, by any commissioner, or by any person deputed by the said commissioners for that purpose, or they may be served in the same manner as a summons in a civil action. Any and all such places, or orchards, or nurseries, or trees, plants, shrubs, vegetables, vines, fruit, or articles thus infested, or premises where the Russian thistle or salt wort or other noxious weeds shall be growing, are hereby adjudged and declared to be a public nuisance; and whenever any such nuisance shall exist at any place within their jurisdiction, or on the property of any nonresident, or on any property the owner or owners of which can not be found by the county board of horticultural commissioners, after diligent search, within the county, or on the property of any owner or owners upon which notice aforesaid has been served, and who shall refuse or neglect to abate the same within the time specified, it shall be the duty of the county board of horticultural commissioners to cause said nuisance to be at once abated, by eradicating or destroying said diseases, insects, or other pests, or their eggs or larvæ, or Russian thistle or salt wort or other noxious weeds. The expense thereof shall be a county charge, and the board of supervisors shall allow and pay the same out of the general

fund of the county. Any and all sum or sums so paid shall be and become a lien on the property and premises from which said nuisance has been removed or abated, in pursuance of this act, and may be recovered by an action against such property and premises. A notice of such lien shall be filed and recorded in the office of the county recorder of the county in which the said property and premises are situated, within thirty days after the right to the said lien has accrued. An action to foreclose such lien shall be commenced within ninety days after the filing and recording of said notice of lien, which action shall be brought in the proper court by the district attorney of the county in the name and for the benefit of the county making such payment or payments, and when the property is sold enough of the proceeds shall be paid into the county treasury of such county to satisfy the lien and costs; and the overplus, if any there be, shall be paid to the owner of the property if he be known, and if not, into the court for his use when ascertained. The county board of horticultural commissioners is hereby vested with the power to cause any and all such nuisances to be at once abated in a summary manner.

SEC. 3. Said county boards of horticultural commissioners shall have power to divide the county into districts, and to appoint a local inspector to hold office at the pleasure of the commissioners, for each of said districts. The State board of horticulture may issue commissions as quarantine guardians to the members of said county board of horticultural commissioners and to the local inspectors thereof. The said quarantine guardians, local inspectors, or members of said county boards of horticultural commissioners, shall have full authority to enter into any orchard, nursery, place or places where trees or plants are kept and offered for sale or otherwise, or any house, storeroom, salesroom, depot, or any other such place in their jurisdiction, to inspect the same, or any part thereof.

SEC. 4. It shall be the duty of said county board of horticultural commissioners to keep a record of their official doings, and to make a report to the State board of horticulture, on or before the first day of October of each year, of the condition of the fruit interests in their several districts, what is being done to eradicate insect pests, also as to disinfecting, and as to quarantine against insect pests and diseases, and as to carrying out all laws relative to the greatest good of the fruit interest. Said board may publish said reports in bulletin form, or may incorporate so much of the same in their annual reports as may be of general interest.

SEC. 5. The salary of all inspectors working under the county board of horticultural commissioners shall be two dollars and fifty cents (\$2.50) per day. In the case of the commissioners themselves, their compensation shall be four dollars per day, when actually engaged in the performance of their duties, and itemized necessary traveling expenses incurred in the discharge of their regular duties as prescribed in this act.

SEC. 6. It shall be the duty of the county board of horticultural commissioners to keep a record of their official doings and make a monthly report to the board of supervisors; and the board of supervisors may withhold warrants for salaries of said members and inspectors thereof until such time as said report is made.

SEC. 7. An act entitled "An act to protect and promote the horticultural interests of the State," approved March fourteenth, eighteen hundred and eighty-one, and certain acts amendatory thereof, approved March nineteenth, eighteen hundred and eighty-nine, and March thirty-first, eighteen hundred and ninety-one, are hereby repealed.

SEC. 8. This act shall take effect and be in force from and after its passage.

HORTICULTURAL QUARANTINE LAW.

AN ACT for the protection of horticulture, and to prevent the introduction into this State of insects, or diseases, or animals, injurious to fruit or fruit trees, vines, bushes, or vegetables, and to provide for a quarantine for the enforcement of this act.

[Became a law, under constitutional provision, without governor's approval, March 11, 1899.]

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. Any person, persons, or corporation who shall receive, bring, or cause to be brought into this State any nursery stock, trees, shrubs, plants, vines, cuttings, grafts, scions, buds, or fruit-pits, or fruit or vegetables, shall, within twenty-four hours after the arrival thereof, notify the State horticultural quarantine officer, or the quarantine guardian of the district or county in which such nursery stock, or fruit or vegetables are received, of their arrival, and hold the same without unnecessarily moving the same or placing such articles where they may be harmful, for the immediate inspection of such State horticultural quarantine officer or guardian. If there is no quarantine guardian or State horticultural quarantine officer in the county where such nursery stock, or fruit, or vegetables are received, it shall then be the duty of such person, persons, or corporation to notify the State board of horticulture, who shall make immediate arrangements for their inspection. The State horticultural quarantine officer, the quarantine guardian, or such person or persons as shall be commissioned by the State board of horticulture to make such inspection or to represent said board, are hereby authorized and empowered to enter into any warehouse, depot, or upon any dock, wharf, mole, or any other place where such nursery stock, or fruit, or vegetables, or other described articles are received, for the purpose of making the investigation or examination herein provided for.

SEC. 2. Each carload, case, box, package, crate, bale, or bundle of trees, shrubs, plants, vines, cuttings, grafts, scions, buds, or fruit-pits, or fruit or vegetables, imported or brought into this State, shall have plainly and legibly marked thereon in a conspicuous manner and place the name and address of the shipper, owner, or person forwarding or shipping the same, and also the name of the person, firm, or corporation to whom the same is forwarded or shipped, or his or its responsible agent, also the name of the country, State, or Territory where the contents were grown.

SEC. 3. When any shipment of trees, shrubs, plants, vines, cuttings, grafts, scions, buds, fruit-pits, or fruit or vegetables, imported or brought into this State, is found infested with injurious insects, or their eggs, larvæ, or pupæ, or reasonable cause to presume that they may be so infested, or infected with tree, plant, or fruit disease or diseases, the entire shipment shall be disinfected at the expense of the owner, owners, or agent. After such disinfection, it shall be detained in quarantine the necessary time to determine the result of such disinfection. If the disinfection has been so performed as to destroy all insects, or their eggs, and so as to eradicate all disease and prevent contagion, and in a manner satisfactory to the State horticultural quarantine officer, the quarantine guardian of the district, or the person commissioned by said board, the trees, vines, vegetables, seeds, or other articles shall then be released. [Amended February 19, 1903.]

SEC. 4. When any shipment of trees, shrubs, plants, vines, cuttings, grafts, scions, buds, fruit-pits, or fruit or vegetables, imported or brought into this State, is found infested with any species of injurious insects, or their eggs, larvæ, or pupæ, not existing in the orchards, vineyards, gardens, or farms of

California, such infested shipments shall be immediately sent out of the State, or destroyed, at the option of the owner, owners, or agent, and at his or their expense.

SEC. 5. No person, persons, or corporation, shall bring or cause to be brought into the State any peach, nectarine, or apricot trees, or cuttings, grafts, scions, buds, or pits of such trees, or any trees budded or grafted upon peach stock or root that has been in a district where the disease known as "peach yellows" or the contagious disease known as contagious "peach rosette" are known to exist, and any such attempting to land or enter shall be refused entry and shall be destroyed or returned to the point of shipment, at the option of the owner, owners, or agent, and at his or other [their] expense.

SEC. 6. No person, persons, or corporations shall bring, or cause to be brought into this State any injurious animals known as English or Australian wild rabbit, flying fox, mongoose, or any animal or other animal or animals detrimental to horticultural and agricultural interests.

SEC. 7. Any person, persons, or corporation violating any of the provisions of this act is guilty of a misdemeanor.

SEC. 8. This act shall take effect and be in force from and after its passage.

PARIS GREEN.

AN ACT to prevent fraud in the sale of Paris green used as an insecticide.

[Became a law under constitutional provision, without governor's approval, February 28, 1901.]

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. It shall be the duty of each and every manufacturer of Paris green (commercial aceto-arsenite of copper) to be used as an insecticide within this State, and of every dealer in original packages of said Paris green manufactured outside of this State, before the said Paris green is offered or exposed for sale, or sold within this State as an insecticide, to submit to the director of the California Agricultural Experiment Station at Berkeley, samples of said Paris green, and a written or printed statement setting forth: first, the brands of said Paris green to be sold, the number of pounds contained in each package in which it is put on the market for sale, the name or names of the manufacturers and the place of manufacturing the same; second, the statement shall set forth the amount of combined arsenic which the said Paris green contains, and the statement so furnished shall be considered as constituting a guarantee to the purchaser that every package of such Paris green contains not less than the amount of combined arsenic set forth in the statement.

SEC. 2. Every purchaser of said Paris green in original packages which is manufactured outside of this State who intends to sell or expose the same for sale, and every manufacturer of said Paris green within this State, shall, after filing the statement above provided for with the director of the California Agricultural Experiment Station at Berkeley, receive from the said director a certificate stating that he has complied with the foregoing statement, which certificate shall be furnished without charge therefor; said certificate when furnished shall authorize the party when receiving the same to deal in this State in the said Paris green. Any person who fails to comply with the terms of section one of this act shall not be entitled to such certificate and shall not be entitled to deal in said Paris green within this State. Nothing in this

section shall be construed as applying to retail dealers selling said Paris green which has already been labeled and guaranteed.

SEC. 3. Paris green when sold, offered or exposed for sale, as an insecticide in this State shall contain at least fifty per centum of arsenious oxide and shall not contain more than four per centum of the same in the uncombined state.

SEC. 4. The director of the California State Agricultural Station at Berkeley shall examine or cause to be examined different brands of Paris green sold, offered or exposed for sale within the State, and cause samples of the same to be analyzed, and shall report results of analyses forthwith to the secretary of the State board of horticulture and to the party or parties submitting said samples, and such report shall be final as regards its quality.

SEC. 5. Any person or persons, firm, association, company, or corporation violating any of the provisions of this act, and any person who shall sell any package of Paris green or any part thereof which has not been labeled as herein provided, shall be guilty of a misdemeanor and shall be fined not less than fifty dollars nor more than two hundred dollars, together with the costs of the suit in an action caused to be brought by the State board of horticulture through its secretary in the name of the people of the State of California.

SEC. 6. The attorney-general of the State of California is charged with the prosecution of all such suits.

SEC. 7. This act shall take effect immediately.

COLORADO.

AN ACT concerning horticulture, and to repeal sections 5, 6, 7, 8, and 9 of an act entitled "An act to create State and county boards of horticulture, define their duties and compensation, to protect and promote the horticultural interests of the State, and to repeal an act to establish a bureau of horticulture, approved March 8, 1883," approved April 5, 1893.

Be it enacted by the general assembly of the State of Colorado:

SECTION 1. Whenever a petition is presented to the board of county commissioners of any county signed by thirty-five (35) freeholders, each one of whom shall be the owner of an orchard of at least two acres situate and growing in said county, stating that in their opinion a necessity exists for protecting the horticultural interests of said county, diminishing and destroying fruit pests and diseases and insects injurious to fruit trees, plants, vines, and shrubs, the said county commissioners shall appoint a competent, experienced horticulturist, a person who shall be known as the county horticultural inspector, who shall hold his office for a period of one year unless otherwise terminated by said board of county commissioners. It shall be the duty of the professor of entomology of the State Agricultural College at Fort Collins, in this State, to examine all persons applying for a license as a horticultural inspector, and if found competent and fully qualified to perform the duties of the office he shall issue to such applicant a license as a county horticultural inspector, which license shall certify to the competence of such applicant and shall authorize him to act as an inspector in any county in the State for a period of two years from its date. Said professor shall receive for such services a fee of five dollars from such applicant. No person shall enter upon the duties of the office of such inspector nor continue in the performance thereof unless holding such a license. Such inspector shall also give a good and sufficient bond before entering upon the duties of his office, in the sum of one thousand dollars, conditioned for the faithful performance of the duties of the office, the surety on

which bond may be a good and responsible guarantee company, and shall be approved by the board of county commissioners. Said inspector shall have the power to appoint as many deputies as may be necessary, subject to the approval of the county commissioners, who shall act under the direction and with the authority of said inspector. Said inspector shall be paid for his services the sum of four (4) dollars per day, and said deputies two dollars and fifty cents per day, out of the county treasury, for as many days' services rendered as the board of county commissioners shall, by resolution, authorize. It shall be the duty of such inspector and his deputies to keep a complete record of their official doings and to make a quarterly report thereof to the board of county commissioners of said county, who shall withhold the warrant for the salary of any delinquent inspector or deputy until such report is made. The inspector shall furnish each owner or manager of an orchard or vineyard within his jurisdiction such blanks as may be provided by the State board of horticulture, containing questions and inquiries as to the condition of his orchard or vineyard and the extent to which the requirements of the inspector have been complied with. Such owner or manager shall fill out said blanks and return them to the inspector, who shall transmit them to the State board of horticulture. The board of county commissioners shall have the power to remove any inspector or deputy who shall, in their judgment, fail to perform the duties of the office.

SEC. 2. No person or persons, either as an owner, agent, servant, employee, or common carrier, shall bring or cause to be brought into any county in the State of Colorado having a county horticultural inspector, from any district, county, State, or foreign country, any trees, vines, shrubs, scions, cuttings, graftings, fruits, or fruit pits, without giving notice of their arrival at their destination, within twenty-four hours thereafter, to the horticultural inspector of said county; nor keep, sell, plant, expose for sale, deliver, give away, or otherwise distribute any of the articles mentioned in this section, or cause or permit the same to be done, except upon order of the county inspector and until they shall first have been inspected as hereinafter provided, and disinfected to the satisfaction of the said inspector.

SEC. 3. Whenever the county horticultural inspector shall be notified of the arrival of any of the articles enumerated in section 2 of this act, he shall within forty-eight hours (48) make a careful inspection of the same, and if any such articles shall be found by him to be infested with any disease, live scale, or insect pests, detrimental or injurious to fruit trees or the product thereof, or to plant life, such infested articles shall be removed from the limits of the county within forty-eight hours thereafter, at the expense of the owner, agent, or shipper, or shall be destroyed. The owner, agent, or shipper shall have the right to elect as to the removal of such infested articles from the county, or to have the same destroyed by order and under the direction of said inspector.

SEC. 4. The county horticultural inspector shall have the power to establish and maintain quarantine and inspecting stations within his county, whenever and wherever the same may be authorized by the board of county commissioners and of such character as they shall direct.

SEC. 5. If the result of the inspection of the county horticultural inspector shall be to put any of the articles mentioned in section 2 of this act in quarantine, such articles shall be exempt from removal from the county during the pendency of such quarantine regulations. Whenever said inspector shall deem it necessary to the safety of the horticultural interests of his county, he may hold in quarantine for information, subsequent inspection or disinfection, and final order relative thereto any of the articles enumerated in said section 2

of this act for such reasonable time as in his judgment is necessary, without unreasonable delay.

SEC. 6. Any person or persons who shall ship or bring or cause to be brought or shipped into any county of the State having a county horticultural inspector any of the articles mentioned in section 2 of this act, shall have placed upon or securely attached to each box, package, or separate parcel of such articles a distinct mark or label showing the name of the owner, agent, or shipper, the name of the grower, and any further evidence necessary to determine the locality where grown.

SEC. 7. It shall be the duty of the county horticultural inspector in each county, whenever he shall deem it necessary, to make an inspection of any orchard, nursery, or trees, or any fruit packing house, storeroom, salesroom, or other place or article within his jurisdiction, and if found infested with insects or pests or diseases injurious to fruit, fruit trees, vines, bushes, or other horticultural interests he shall notify the owner or owners, or person or persons in charge or in possession of such trees, place, or other thing as aforesaid, that the same or any of them are infested with insects or their eggs or larvæ or with fruit or fruit-tree diseases, and shall give a formula for the treatment thereof, and such person or persons so notified shall eradicate or destroy the said insects or pests, or their eggs or larvæ, within a certain time to be specified in said notice. Said notices may be served upon the person or persons, or either of them, owning or having charge or having possession of such infested place, trees, or other thing as aforesaid, by the inspector or any deputy inspector. Any and all such places, trees, or other thing thus infested are hereby declared and adjudged to be a public nuisance. Whenever any such nuisance shall exist at any place within his jurisdiction on the property of any non-resident, or on any property the owner or owners of which can not be found by the inspector after diligent search within the county, or on the property of any owner or owners upon which notice has been served, and who refuses or neglects to abate the same within the time specified or to follow the directions given by the said inspector for disinfecting the same, it shall be the duty of such inspector to cause the same to be at once abated by eradicating or destroying said insects or other pests, their eggs or larvæ, so far as practicable, and he may, if necessary, cut back, disinfect, fumigate, or burn said infested trees, vines, and shrubs, as well as other articles in the vicinity which are also infested, but the inspector shall not proceed to abate any such nuisance where his directions have been followed.

The expense thereof shall be first paid by the county upon filing of proper vouchers therefor. Any and all sums so paid, together with the inspector's salary while engaged upon said property, shall be and become a lien on the property and premises from which said nuisance has been removed or abated in pursuance of this act, upon the filing with the county clerk and recorder of the said county a sworn statement, showing the itemized amount of such sum or sums and a description of such property or premises. Such lien may be foreclosed by an action against such property and premises, which action shall be brought by the district attorney in the name and for the benefit of the county making such payment. When the property is sold the proceeds thereof shall be paid into the county treasury of such county to satisfy the lien and costs, and the overplus, if any, shall be paid to the owner by order of the board of county commissioners upon his applying therefor.

SEC. 8. It shall be unlawful for any person or persons to spray fruit trees while in bloom with any substance injurious to bees.

SEC. 9. Any person violating any of the provisions of this act shall be guilty

of a misdemeanor, and upon conviction thereof shall be punished by imprisonment in the county jail for a period of not less than ten nor more than one hundred days, or by a fine of not less than ten dollars nor more than one hundred dollars. Any justice of the peace or district or county courts of the respective counties shall have jurisdiction to try any case arising under the provisions of this act.

SEC. 10. Sections 5, 6, 7, 8, and 9 of an act entitled "An Act to create state and county boards of horticulture; define their duties and compensation; to protect and promote the horticultural interests of the State and to repeal an act to establish a bureau of horticulture, approved March 8, 1883," approved April 5, 1893, are hereby repealed.

SEC. 11. In the opinion of the general assembly an emergency exists, therefore this act shall take effect and be in force from and after its passage.

Approved April 16, 1897.

CONNECTICUT.

CHAPTER 238, GENERAL STATUTES OF CONNECTICUT.

SECTION 4386. *State entomologist; appointment.*—Said board of control shall appoint a State entomologist to hold office during the pleasure of the board, who shall have an office at the experiment station, but shall receive no compensation other than his regular salary as a member of the station staff. He may appoint such number of deputies, not exceeding three, as he may deem necessary.

SEC. 4387. *Duties.*—The State entomologist, either personally or through his deputies, shall visit any orchard, field, garden, nursery, or storehouse, on request of the owner, to advise treatment against pests. He may inspect any orchard, field, or garden, in public or private grounds, which he may know or have reason to suspect to be infested with San José scale or any serious pests or infectious diseases, when in his judgment such pests or infectious diseases are a menace to adjoining owners; and may order the owner, occupant, or person in charge thereof, in writing, to properly spray or give other suitable treatment, or to cut and destroy any such diseased trees or shrubs, if in the opinion of the State entomologist such action is necessary, and the owner thereof shall not recover from nor be recompensed therefor by the State. If the owner of such orchard, field, or garden neglects or refuses to comply with the order of the said State entomologist, he shall be fined not more than fifty dollars. The State entomologist may issue such bulletins of said experiment station as in his judgment are needed to convey information about pests; may conduct experiments and investigations regarding injurious insects and the remedies for their attacks; diffuse such information by means of correspondence, lectures, and published matter, and may employ such assistants in his office, laboratory, or in the field, and purchase such apparatus and supplies as may be necessary. He shall keep a detailed account of expenses, and publish each year a report of such expenses and of the work done.

SEC. 4388. *Certificate of inspection of nursery stock.*—All nursery stock shipped into this State from any other State, county, or province shall bear on each package a certificate that the contents of said package have been inspected by a State or Government officer, and that said contents have been thoroughly fumigated and appear free from all dangerous insects or disease. In case nursery stock is brought within the State without such a certificate, the consignee may return it to the consignor at the latter's expense or may call the State entomologist

to inspect the same and deduct the costs of such inspection from the consignor's bill for such stock. This section shall be deemed to be a part of every contract made in this State for the sale of nursery stock to be shipped into this State.

SEC. 4389. *Inspection of nurseries; penalty.*—All nurseries or places where nursery stock is grown, sold, or offered for sale shall be inspected at least once each year by the State entomologist or one of his deputies, and if no serious pests are found a certificate to that effect may be given. If such pests are found, the owner shall take such measures to suppress the same as the State entomologist may prescribe. If such measures are not immediately taken by the owner of such nursery or place such certificate shall be withheld, and every nurseryman who does not hold such a certificate, after the first annual inspection, who shall sell or otherwise dispose of nursery stock, shall be fined not more than fifty dollars. The form of certificate and the season for inspecting nurseries may be determined by the State entomologist. The State entomologist or any of his deputies may at all times enter any public or private grounds in the performance of his duty.

SEC. 4390. *Appropriation.*—The sum of three thousand dollars is appropriated to carry out the provisions of sections 4386, 4387, 4388, and 4389, which sum is to be paid quarterly to the treasurer of said station, who shall hold the same subject to the order of the State entomologist.

DELAWARE.

CHAPTER 216.

AN ACT to provide and establish a State board of agriculture and to prescribe its powers and duties.

Be it enacted by the senate and house of representatives of the State of Delaware in general assembly met:

SECTION 1. That when and as soon as this act becomes a law, the governor of this State shall appoint three commissioners of agriculture, by and with a consent of a majority of all the members elected to the senate, one of whom shall reside in each county of the State, and one of whom shall be of different political faith from the other two, and one of whom shall be appointed and commissioned for the term of one year, another one of whom shall be appointed and commissioned for the term of two years, and the remaining one of whom shall be appointed and commissioned for the term of three years, which said commissioners and their successors in office are hereby made a department to be known as the State board of agriculture, to continue and remain such for the term of eight years from the date of the qualifications of the commissioners first appointed, and to remain and continue such board after such term or period of years has expired and until said board shall be abolished by the general assembly. The successors to the commissioners first appointed shall each be appointed for terms of three years when and as the terms of the first commissioners expire. The commissioners shall hold office until their successors become duly qualified. If any vacancy occurs in the office of commissioner of agriculture before the expiration of any term of office hereby prescribed, each vacancy shall be filled by appointment by the governor for the remainder of the term: *Provided, however,* That in case such vacancy shall occur when the senate is not in session such vacancy shall be filled by the governor without confirmation by the senate until the end of the next session of the senate.

SEC. 2. The commissioners of agriculture shall each receive as compensation

for their services the sum of four dollars per day and actual traveling expenses: *Provided*, They shall not exceed twenty days in each year, and an annual appropriation of one thousand dollars annually, to be paid quarterly by the State treasurer out of any moneys appropriated by the general assembly for said board. At all meetings of said board a quorum for the transaction of any and all business that may come before the board shall consist of any two of the commissioners. The board shall meet at least once in every three months at such place or places as they may select. The first meeting of the board shall be held within ten days after the qualification of the commissioners, and at said meeting the board shall elect one of its members as president.

SEC. 3. The board of agriculture shall have and possess the power to abate, suppress, eradicate, and prevent, by such means as shall be prescribed and provided by law or by rule, order, or regulation of said board, the San Jose scale, peach yellows, pear blight, and all other contagious and infectious and injuriously dangerous diseases of fruit trees, plants, vegetables, cereals, horses, cattle, and other farm animals; to devise such plans for securing immigration to this State of industrious and useful settlers as it may consider advisable, and to execute such plans in the manner prescribed by law; to make and adopt rules for the government of the board and the same to change, alter, and modify, from time to time, as the board may wish; to employ and discharge such inspectors, officers, employees, agents, and servants as in its opinion may be necessary to carry out the provisions of this act: *Provided, however*, That the remuneration or wages to be paid to any such inspectors, officers, employees, or agents in any year shall not, together with the other expenses of the board, exceed the appropriation annually made to the board by the general assembly in and for that year; to make rules for the proper government of all inspectors, officers, employees, agents, and servants who may be employed by the board.

SEC. 4. That in order to abate and prevent, eradicate, and exterminate the diseases of fruit trees known as the San Jose scale, the peach yellows, the pear blight, and all other injuriously dangerous insect pests and plant diseases which may appear in this State, it shall be the duty of the board of agriculture to seek out and suppress in the manner herein provided all the injurious insect pests and diseases hereinbefore mentioned, and also any new diseases or pests destructive to the agricultural and horticultural interests of the State, and also to conduct experiments when necessary to accomplish that end; and upon knowledge of the existence of any of said diseases, or any new disease or insect pest in any of the fruit trees, plants, vines, shrubs, and grains of this State, to mark or tag in some conspicuous way all such trees, plants, vines, shrubs, or grains, and to notify in writing the owner or owners thereof or the tenant in possession of the premises in which the said trees, vines, plants, shrubs, or grains are found of the existence therein of said disease, or any new disease as aforesaid, and to prescribe the proper treatment and remedies therefor, and should such owner or owners of such infested trees, vines, plants, shrubs, or grains, or the tenant or tenants in possession of the premises whereon said trees, plants, vines, shrubs, or grains are found, neglect, fail, or refuse within ten days after receiving the notice aforesaid to apply the remedy or remedies prescribed by the board of agriculture and also in the manner and at the times as ordered and directed by the said board, then and in such case it shall be the duty of the said board, its agents, or servants, to cause the remedy or remedies prescribed to be applied at the expense of the owner or owners of such infested trees, plants, vines, shrubs, or grains, and said board shall have the power, when it deems it necessary, to cause the trees, plants, vines, shrubs, or grains so infested as aforesaid to be destroyed at the expense of the owner or owners thereof, or the tenant or tenants

in possession as aforesaid, and the loss to fall upon such owner or owners, tenant or tenants, as aforesaid.

The said board of agriculture, its agents, officers, or servants shall treat or have treated at the expense of the owner or owners in order to prevent the spread or dissemination of the aforesaid insects or diseases, or any new ones which may appear, and all suspicious trees, vines, shrubs, plants, or grains found to be in a dangerous proximity to those infested as aforesaid.

SEC. 5. That should any owner or owners of any trees, vines, shrubs, plants, or grains infested as aforesaid, or the tenant or tenants in possession of the premises whereon any such trees, vines, shrubs, or grains are found, or should any owner or owners of any trees, vines, shrubs, plants, or grains in dangerous proximity to those infested as aforesaid, fail, neglect, or refuse after thirty days' notice by said board to pay all of the expenses incurred by the said board in treating or in destroying such infested trees, plants, shrubs, vines, or grains, or those in dangerous proximity thereto, he or they shall be guilty of a misdemeanor, and upon conviction thereof shall be fined not less than double the amount of the expenses incurred by the said board in treating or destroying the trees, plants, vines, shrubs, or grains aforesaid, and shall also be liable in a civil suit to be brought in the name of the "State board of agriculture" for the recovery of such expenses, together with all costs of suit. Said action may be brought before any justice of the peace of the county wherein such trees, plants, vines, shrubs, or grains mentioned herein are found, or in the superior court of the State of Delaware in any county. The right of appeal shall be the same as in other civil causes.

SEC. 6. That in order to accomplish the purposes of this act, the said board of agriculture, its officers, employees, agents, and servants are hereby authorized to enter upon any public premises, parks, cemeteries, or other premises, or upon any land of any person or persons, firm or firms, corporation or corporations within this State for the purpose of inspecting, examining, destroying, treating, or experimenting upon the insects and diseases aforesaid.

SEC. 7. That it shall be the duty of the board of agriculture to send at least one of its officers, agents, or employees at least once a year into each county of the State for the purpose of examining and determining thereby the healthfulness and general condition of the horticultural and agricultural interests.

SEC. 8. That the board of agriculture, whenever it shall receive reliable information, or shall otherwise know, that any dangerously injurious insect, pest, or disease exists in any tree, vine, shrub, plant, or grain, anywhere in the State, shall, in addition to the other duties, acts, and things herein prescribed to be done and performed by it, warn the farmers and other persons residing in the hundred in which any such insect, pest, or disease exists, and also persons living near the infested places of the nature of such insect, pest, or disease, and the localities where it exists, and shall also furnish to the said farmers and said other persons any and all information and knowledge the said board may have or be able to procure of the remedies to be applied to suppress, abate, and eradicate the said insects, pests, or diseases.

SEC. 9. That the said board of agriculture shall examine and inspect, or cause to be examined and inspected, at least once every year, at such time as it shall deem it best, any and all nurseries of trees, vines, shrubs, plants, grafts, cuttings, and buds in this State subject to the aforesaid insects, pests, and diseases, and if found apparently free, so far as can be determined by inspection, from the insects, pests, and diseases aforesaid to make and issue and give to the owner or owners or persons in charge of the said nurseries a certificate of inspection in such form as said board may prescribe, certifying that such nurseries or prem-

ises have been examined and inspected and are apparently free from all insects, pests, and diseases dangerously injurious to nursery stock. If any of the said insects, pests, or diseases shall be found in any nursery or orchard or on any premises within the State where said nursery stock is grown, the said board of agriculture, its officers, agents, or servants, shall cause to be destroyed or treated as hereinbefore provided, such portion of such nursery stock as, in the opinion of said board, may be necessary, and shall release all other stock grown upon said premises, and shall make and issue a certificate of inspection to the effect and in the manner as hereinbefore prescribed; and, if such infested nursery stock be destroyed as herein provided, then the owner or owners shall pay the costs thereof; and if he or they refuse or neglect to pay the same it shall be collected as provided in section 5 of this act.

SEC. 10. That it shall be unlawful for any nurseryman, broker, agent, dealer, or other person to sell or offer for sale, or ship, send out, or give away, by mail, express, freight, or otherwise, any trees, vines, plants, shrubs, buds, grafts, or cuttings from any nursery or orchard mentioned in this act, or any premises within this State where said nursery stock is grown, without accompanying the same with a copy of the certificate aforesaid, printed upon a tag or label not easily destroyed, which shall be firmly attached or fastened in a conspicuous position upon each carload, box, bale, or package so sold or offered for sale, or shipped, sent out, or delivered.

SEC. 11. That if any nurseryman, agent, broker, dealer, or other person shall sell or offer for sale or deliver within this State or ship, transport, or send out of this State, to any other State or Territory of the United States, or foreign possession thereof, or to the District of Columbia, any trees, plants, shrubs, vines, grafts, cuttings, and buds, commonly known as nursery stock, subject to the insects, pests, and diseases in this act mentioned, without attaching a copy of the certificate aforesaid, or shall deface or mutilate, or destroy said certificate, or wrongfully attach a certificate, he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall forfeit and pay a fine of not more than five hundred dollars nor less than one hundred dollars, besides the costs of prosecution, or be imprisoned for a term of not less than one month nor more than one year.

SEC. 12. That all trees, plants, vines, shrubs, buds, grafts, and cuttings, commonly known as nursery stock, grown or handled by each and every nurseryman in this State, and subject to the aforesaid insects, pests, and diseases, shall be fumigated or treated by the nurseryman owning the same in the manner, method, and way prescribed by the said board of agriculture, which said board is hereby authorized and empowered to make and adopt rules and regulations, and the same to alter, change, and modify from time to time, as in its judgment is best for the proper fumigation or treatment of infected trees, plants, vines, shrubs, buds, grafts, and cuttings. If any person shall wilfully and knowingly violate any of said rules he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall forfeit and pay a fine of twenty-five dollars for each offense.

SEC. 13. That when any trees, plants, shrubs, vines, buds, grafts, or cuttings, commonly known as nursery stock, are shipped, sent, or mailed into this State to any nurseryman, broker, dealer, agent, or other person in this State, every carload, bale, box, or package thereof shall be plainly labeled on the outside with the name of the consignor and the name of the consignee, and shall have attached or fastened thereto a certificate showing that the contents thereof have been examined by a duly qualified State or Government officer and found apparently free from all insect and fungous diseases dangerously injurious to nursery stock.

SEC. 14. That whenever any trees, plants, vines, shrubs, buds, grafts, or cuttings are shipped or sent into this State without the aforesaid certificate plainly attached or fastened on the outside of each carload, box, bale, or package the same shall be and they are hereby made, deemed, and considered public nuisances, to be abated in the manner hereinafter provided, and the agent of the transportation company or person or firm receiving the same shall not deliver said nursery stock to any one, but shall at once notify the said board of agriculture of such nuisances. The said board shall thereupon institute proceedings before any justice of the peace to abate such nuisances. The said justice of the peace shall summon all parties in interest before him, if they be known and can be summoned; if not, then such of them as can be summoned, to show cause why such nuisances shall not be abated; and at the trial or hearing of said cause, if the said justice of the peace shall determine that the provisions of this act have been violated, he shall order and direct that the nuisances be abated by the return of such nursery stock by the agent aforesaid receiving the same to the consignor, unless such consignor, his agent, or the consignee or his agent shall at his or their own expense forthwith have the nursery stock aforesaid inspected and examined by a duly authorized officer or employee of said board of agriculture, and said officer or employee shall certify to said justice of the peace that such nursery stock is apparently free from the disease mentioned in this act, and tag every such carload, box, bale, and package so inspected with his certificate; but if said agent, consignor, or consignee or other person above mentioned shall fail or neglect to have said inspection made, or fail to return such carload, box, bale, or package, then said justice shall order said nuisances to be abated by totally consuming by fire the contents of every such carload, box, bale, or package by the officers, agents, or employees of said board of agriculture. No action shall be brought by any one to recover any damages for any loss sustained in carrying out the foregoing provisions, and any and all loss shall be borne by the person suffering the same.

SEC. 15. That if any agent of a transportation company, firm, or person shall knowingly receive a carload, box, bale, or package of trees, plants, shrubs, vines, buds, or cuttings without a certificate attached, as hereinbefore provided, and shall fail to immediately notify the said board of agriculture, as hereinbefore provided, he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall forfeit and pay a fine of fifty dollars for each offense, besides the costs of prosecution.

SEC. 16. That if any nurseryman, dealer, or agent shall sell, ship, or deliver any trees, vines, plants, shrubs, grafts, or cuttings into or in this State which are infested with any of the aforesaid diseases, and which upon inspection by the said board of agriculture or its officers or agents are found to be so infested, the said nurseryman, dealer, or agent shall forfeit the value of such nursery stock and shall not collect or receive the same from the purchaser or consignee; and if the purchaser or consignee has theretofore paid for said stock, either in whole or in part, he shall have a right of action against such nurseryman, dealer, or agent to recover the sum or sums so paid in an action on the case. All trees, vines, plants, shrubs, grafts, and cuttings so shipped, sold, or delivered as aforesaid, and inspected and found infested as aforesaid, shall be deemed public nuisances, and shall be abated in the same way and manner as provided for in section 14 of this act.

SEC. 17. The said board of agriculture shall submit annually to the governor a written report of its inspections, experiments, and investigations and a full account of the expenditures, together with such other matters as may be deemed advisable by the said board, and with such recommendations as the said board shall consider proper to make, which the governor shall transmit to the general

assembly at each session thereof; and which said report shall be printed in pamphlet form for distribution in such number as the general assembly shall direct.

SEC. 18. That all moneys appropriated by law to the said board of agriculture to carry out the provisions of this act except the salaries of the commissioners shall be paid by the State treasurer to the president of the said board upon the presentation to said State treasurer by said president of a bond for the sum of three thousand dollars, executed by him, and by good and sufficient sureties to be approved by the governor, conditioned for the faithful disbursement of said moneys according to law. The said president shall control, handle, and pay off such moneys.

SEC. 19. That it shall be the duty of the said board of agriculture to encourage and invite desirable immigration to this State, and for this purpose the said board may prepare, publish, and circulate circulars or pamphlets setting forth the agricultural, mechanical, and other resources of the State: *Provided*, That the amount annually expended under authority of this section shall not exceed the sum of one hundred dollars.

SEC. 20. That any member of the said board of agriculture who shall be guilty of neglect of duty or of the violation of any of the provisions of this act shall, upon conviction thereof before any justice of the peace of this State, be fined for each offense an amount of not less than twenty-five nor more than fifty dollars, together with costs of each suit.

SEC. 21. That all fines collected under the provisions of this act shall be paid to the president of the said board of agriculture by the officers collecting or receiving the same, within thirty days after such collection or receipt, which shall be used by the said president of said board in defraying the expenses of the board.

SEC. 22. That the said board of agriculture shall have power to compel all growers of fruit to stamp or mark the baskets, boxes, packages, crates, parcels, or other receptacles used by them for the shipment of any fruit or fruits with his, her, or their name or names, initial or initials, or with some distinguishing device or mark which may be readily and easily read and seen on the same; and said board may adopt rules and regulations to carry this into effect. If any grower of any fruit or fruits shall neglect or fail, after ten days' notice of said board, to comply with the provisions of this section, he or she or they shall be guilty of a misdemeanor and upon conviction thereof shall forfeit and pay a fine of five dollars.

FLORIDA.

There is no law in Florida relating to the control of injurious insects.

GEORGIA.

ACTS OF THE GENERAL ASSEMBLY OF GEORGIA, APPROVED DECEMBER 21, 1897,
DECEMBER 20, 1898, AND DECEMBER 21, 1900.

Be it enacted by the general assembly of Georgia:

SECTION 1. That from and after the passage of this act, the commissioner of agriculture of the State of Georgia, the president of the Georgia State Horticultural Society, and the president of the Georgia State Agricultural Society shall, *ex officio*, constitute a board to be known as the State board of entomology, of

which the commissioner of agriculture shall be chairman, which board shall have full power to enact such rules and regulations governing the inspection, certification, sale, transportation, and introduction of trees, shrubs, cuttings, buds, vines, bulbs, and roots that they may deem necessary to prevent the further introduction, increase, and dissemination of insect pests and plant diseases.

SEC. 2. That the State entomologist appointed by the commissioner of agriculture, under the provisions of the act cited above, approved December 21, 1897, shall act as an inspector under the provisions of this act, and it shall be the duty of the said board to promulgate rules and regulations in accordance with this act for the government of the said entomologist in the duties devolving upon him in the execution of the provisions of this act.

SEC. 3. That the salary of the said entomologist shall not exceed one thousand and five hundred dollars per annum, and that said salary shall be paid out of the funds in the agricultural department arising from the inspection of oils. In addition to the above appropriation, the sum of three thousand and five hundred dollars per annum is hereby appropriated out of the funds in the agricultural department arising from the inspection of oils, for the purpose of defraying the expenses of the execution of this act, the equipment of a laboratory, the traveling and other incidental expenses of the entomologist, and the issuing of reports and other publications. The board may also employ such assistants to the entomologist as may be deemed necessary.

SEC. 4. The entomologist shall have power under the regulations of the board of control to visit any section of the State where such pests are supposed to exist, and shall determine whether any infested trees or plants are worthy of remedial treatment or shall be destroyed. And he shall immediately report his findings in writing, giving reasons therefor, to the owner of the infested plantation, his agents or tenants, and a copy of each report shall also be submitted to the said board. In case of objection to the findings of the inspector, an appeal shall be made to the said board, who shall have the power to summon witnesses and hear testimony on oath, and whose decision shall be final. An appeal must be taken within three days and shall act as a stay of proceedings until it is heard and decided.

SEC. 5. Upon the findings of the inspector in any case of infested trees or plants, the treatment prescribed by him shall be executed at once (unless an appeal is taken), under his supervision; cost of material and labor shall be borne by the owner: *Provided, however,* That in case the trees or plants shall be condemned, they shall be destroyed by the inspector, and the expense of such action shall be borne by the owner. No compensation shall be allowed for any plants that shall be destroyed.

SEC. 6. In case any person or persons refuse to execute the directions of the inspector or of the said board after an appeal, the county judge or ordinary shall, upon complaint filed by the inspector or any freeholder, cite the person or persons to appear before him within three days' notice after being served, and that the said judge or ordinary may hear and determine all these cases in vacation; and, upon satisfactory evidence, shall cause the prescribed treatment to be executed, and the expense thereof and costs of court shall be collected from the owner or owners of infested plants.

SEC. 7. It shall be unlawful to offer for sale, sell, give away or transport plants, scions, buds, trees, shrubs, vines or other plants, tubers, roots, cuttings, bulbs, known to be infested with dangerously injurious insects or plant diseases. Any person or persons violating this section shall upon conviction thereof be guilty of a misdemeanor.

SEC. 8. The said board of control, its agents or employees, are hereby empowered with authority to enter upon any premise in discharge of the duties herein prescribed. Any person or persons who shall obstruct or hinder them or their agents in the discharge of these duties shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be guilty of a misdemeanor.

SEC. 9. The board shall have the power to also adopt rules and regulations, not inconsistent with the laws and constitution of this State and the United States, for preventing the introduction of dangerously injurious crop pests from without the State, and for the governing of common carriers in transporting plants liable to harbor such pests to and from the State, and such regulations shall have the force of laws.

SEC. 10. It shall be unlawful for any grower, nurseryman, or corporation to ship within the State of Georgia any trees, shrubs, cuttings, vines, bulbs, roots without having been previously inspected by either a State or experimental station entomologist or Government officer, within twelve months of the date of said shipment, and certificate of inspection to accompany each box or package. Violation of this clause will be considered as a misdemeanor and punishable as such.

SEC. 11. *Be it further enacted*, That the members of the said board, any two of whom shall constitute a quorum in the absence of the third, shall, within 30 days from the passage of this act, draw up and promulgate through the press of the State the rules and regulations necessary to carry into full and complete effect the provisions of this act, carefully defining what diseases or maladies, both insect and fungus, shall constitute infestation in trees or plants within the meaning and purview hereof.

SEC. 12. *Be it further enacted*, That any person or persons residing in the State of Georgia, dealing in or handling trees, etc., shall be compelled to have his or their stock inspected annually on or before the 1st of November of each year. If, upon such inspection, such stock is found to conform to the requirements of the board of control, the inspector shall furnish a certificate to that effect. And any such person or persons making a shipment before the filing of such certificate with the chairman of the board of control shall be guilty of a misdemeanor.

SEC. 13. Each and every person residing in States or countries outside of the State of Georgia dealing in or handling trees, plants, cuttings, vines, shrubs, bulbs, and roots in this State, shall register his name or firm and file a copy of his or its certificate of inspection furnished by the entomologist, fruit inspector, or duly authorized government official of his State or country, with the chairman of the board of control. Upon failure so to do, said stock shall be liable to confiscation under order of the inspector.

SEC. 14. When two reputable citizens of any county in Georgia shall notify the board, from belief, that noxious insects or plant diseases exist in their county, the said inspector shall be directed to ascertain as speedily as possible by personal investigation, and in such other manner as he may deem expedient, the extent of the infection, and shall act with all due diligence to suppress and eradicate the said pests and give notice to the owner, tenant, or agent of such premises to treat such infested plants according to the methods he may prescribe, or destroy them within ten days from date of such notice, and if, after the expiration of such period of ten days, the infested plants have not been treated or the treatment has not been properly applied or is not effectual in ridding plants of the pests, the inspector shall cause such plants to be properly treated or destroyed as his judgment warrants. The cost of the work shall be covered by execution from the owner of the premises.

QUARANTINE LAW AGAINST THE MEXICAN COTTON BOLL WEEVIL.

[Sections of an act of the general assembly of the State of Georgia, approved August 15, 1904, and section 17 as amended August 23, 1905.]

SECTION 15. It shall be unlawful for any person to knowingly bring into the State of Georgia any living Mexican boll weevil, or any cotton bolls, squares, plants, or seeds containing the adult, pupal, larval, or egg stage of said Mexican boll weevil unless the person shall immediately upon its discovery at once destroy the same or turn over the same to the State entomologist. Violation of this section shall be punished as provided by section 1039 of the Penal Code of Georgia of 1895.

SEC. 16. No cotton seed, seed cotton, cotton-seed hulls or cotton lint, in bales or loose, shall be brought into this State from any points in the States of Texas and Louisiana, or from any other point in any other State or country wherein the Mexican boll weevil is known to exist, without having attached thereto in a prominent and conspicuous manner, a certificate signed by a duly authorized State or governmental entomologist stating that said cotton seed, seed cotton, cotton-seed hulls, or cotton lint, was grown in, and that the shipment of same originated in, a locality where by actual inspection by said official, or his agent, the Mexican boll weevil was not found to exist. Any steamship, railroad, or express company or other common carrier, or any firm, person, or corporation bringing into this State any of the articles above mentioned without the specified certificate attached shall be deemed guilty of a misdemeanor. In case any common carrier enumerated violates this section, then the general manager of such common carrier or the captain of such offending vessel shall be deemed guilty and upon conviction shall be punished as provided by section 1039 of the Penal Code of Georgia of 1895.

SEC. 17. No corn in the shuck, or shipment of household goods, furniture, machinery, glassware, or supplies of any description which are packed or partially packed in or with cotton lint, cotton seed, seed cotton, hulls, seed cotton and cotton seed sacks, or corn in the shuck, shall be shipped into this State from points in Texas and Louisiana, or any other State or country in which the Mexican cotton boll weevil is known to exist, without having attached thereto in a prominent and conspicuous manner the certificate provided for in section 16.

SEC. 18. Transportation companies shall immediately notify the State entomologist (Atlanta, Ga.,) when by oversight, negligence, or otherwise any shipments of the nature designated in sections 16 and 17, without a proper certificate attached, shall arrive at any station or wharf in this State, and it shall be his duty to proceed as speedily as possible, by himself or assistant, to investigate such shipment. If upon investigation he find the shipment to be of the nature herein designated he shall order same removed from this State. Upon failure of the owner or shipper to remove same within forty-eight hours after notice has been sent him by wire, said shipment shall be seized and burned.

SEC. 19. The State entomologist and his assistants shall have authority to enter, during reasonable business hours, any depot, warehouse, freight, wharf, transfer, steamship, or express office in this State and shall be allowed full access to all waybills, invoices, and bills of lading therein, when he or they may deem it necessary to determine the presence or record of any shipments of the nature designated in sections 16 and 17 of this act. The State entomologist and his assistants shall have authority to enter at any time, for the purpose of inspecting shipments therein, or for determining the nature of shipments therein, any express car or steamship when same is in transit or lying at dock or depot in charge of any employee or official of the company owning or oper-

ating same. Agents and employees of railroads shall be required to open for inspection any car, sealed or unsealed, at any siding, freight yard, or depot in this State, when so ordered by the State entomologist or his assistant. Any person who shall refuse to comply with the instructions of the State entomologist or his assistants as herein specified, or who shall offer any hindrance or shall obstruct the State entomologist or his assistants in the discharge of their duties as herein specified shall be deemed guilty of a misdemeanor, and upon conviction shall be punished as provided by section 1039 of the Penal Code of Georgia of 1895.

SEC. 20. The State entomologist, himself or assistants, shall have power to enter during ordinary business hours any premises, depot, warehouse, cotton mill, oil mill, or other building or place in this State where agricultural products are or are supposed to be, for the purpose of inspecting and determining whether any boll weevils are there present. In case of finding any material therein infested with the boll weevil he shall at once give instructions to the owner, agent, or tenant thereof to destroy, fumigate, or treat such infested material in such manner as in his judgment he may deem best. But in the event said material should be ordered destroyed, the owner shall be compensated as now provided by law in cases where property is condemned for public use. Failure of the agent, owner, or tenant to comply with said directions (unless an appeal be taken as provided for in section 4 of this act) or the removal of said infested material or any part thereof from the premises, shall be deemed a misdemeanor and shall be punished as provided by section 1039 of the Penal Code of Georgia of 1895.

RULES AND REGULATIONS.

1. In accordance with section 11 of said act, the following insects and fungous diseases are hereby declared, individually and severally, to constitute infestation in trees and plants, this list to be revised at the will of the board of entomology:

The San Jose scale (*Aspidiotus perniciosus*).

The new peach scale (*Diaspis pentagona*).

The woolly aphis of apple (*Schizoneura lanigera*).

Black knot of plum and cherry (*Plowrightia morbosa*).

The crown gall (*Dendrophagus globosus*).

The Mexican cotton boll weevil (*Anthonomus grandis*).

Rosette of peach and plum.

Yellows of peach.

2. The State entomologist is hereby charged with the enforcement of said act, and as inspector is directed to locate by personal investigation, correspondence, and in such other manner as he may deem best the above-named pests so far as they may exist in this State, and give proper directions and take such steps in accordance with the above-cited act as he may deem necessary to control or eradicate the same.

3. In accordance with section 5 of the above-cited act, the State entomologist is hereby endued with power to condemn and destroy any infested trees, shrubs, or other plants that in his judgment are not worthy of remedial treatment, when such infestation is, or is likely to become, a menace to the agricultural interests of any section of the State, or when the owner or owners of infested premises shall refuse or neglect to properly execute the treatment prescribed for him or them.

4. Any trees, shrubs, or other plants commonly known as nursery stock shipped within the State of Georgia without each box, bundle, or package (in each car-

load or less than carload lot) being plainly labeled with the official entomologist's certificate to the effect that the contents of same have been inspected and found to meet with the requirements of the board of entomology in accordance with section 10 of the act cited above shall be liable to confiscation upon the order of the inspector.

5. No trees, shrubs, or other plants commonly known as nursery stock shall be sold, delivered, or given away within the State of Georgia without being plainly labeled with the certificate of the State entomologist.

6. Persons or firms within the State of Georgia growing for sale trees, cuttings, shrubs, vines, or other plants commonly known as nursery stock shall make application to the State entomologist (Atlanta, Ga.) for inspection and certificate on or before July 1st of each year. Any person, corporation, or firm failing to make application to have his or their stock inspected as aforesaid, after receipt of notice of this rule, shall not be permitted to offer for sale in this State any of said stock not inspected: *Provided*, That such person, corporation, or firm may make written application to the State board of entomology to be relieved of his or their default and consequences, and offering to pay any additional expense incurred by the State and its officers by reason of such failure. The board may upon a proper showing order an inspection of said nursery.

7. In case some part of a nursery shall be found infested with San Jose scale no certificate shall then be granted: *Provided, however*, That isolated blocks of nursery stock not infested may be considered as separate nurseries and a certificate may be granted covering such stock after all stock in the infested block has been destroyed.

8. Each and every box, bundle, or package of trees, shrubs, and other plants commonly known as nursery stock, shipped in carload lots or less than carload lots into the State of Georgia from any other State or country, shall be plainly labeled with a certificate of inspection furnished by the entomologist, fruit inspector, or other duly authorized official in the State or country in which said stock was grown, and also with the official tag of the Georgia State board of entomology hereinafter provided for; said tag to be valid only until July 1st following the date of certificate upon which it is based (see sections 9 and 13 of the act cited above). Such shipments not so labeled shall be liable to confiscation upon the order of the inspector.

9. Any person or persons residing in States or countries outside of the State of Georgia, dealing in or handling trees, shrubs, or other plants in this State, or shipping trees, shrubs, or other plants therein, shall file with the State entomologist (Atlanta, Ga.) a certified copy (or signed duplicate of original) of the certificate issued by the entomologist, fruit inspector, or other duly authorized official of the State or country in which said stock was grown. Such certificate for nurseries south of the northern boundary line of North Carolina, Tennessee, and Arkansas must be based upon an inspection made not earlier than July 1st, and for nurseries north of said line, upon an inspection made not earlier than June 1st. Said person or persons shall also file with the State entomologist a signed statement in which said person or persons agree to fumigate with hydrocyanic-acid gas all stock shipped into the State of Georgia. Such fumigation shall be in a manner approved by the State entomologist. Upon receipt and approval of the certificate and statement above mentioned, the certificate of the Georgia State board of entomology will be issued to the applicant without charge, and official tags bearing a facsimile copy of such certificate and the seal of the State board will be furnished the applicant at cost of printing, viz: Sixty cents for the first one hundred or part thereof and twenty-five cents for each additional hundred.

10. No transportation company or common carrier shall deliver any box, bundle, or package of trees, shrubs, or other plants commonly known as nursery stock, shipped from any other State or country to any consignee at any station in the State of Georgia, unless each box, bundle, or package is plainly labeled with a certificate of inspection furnished by the official entomologist of the State or country in which said stock was grown, and also with the official tag of the Georgia State board of entomology hereinabove provided for. Such shipments of the nature designated above, originating in the State of Georgia, need only have the certificate of the State entomologist, and unless his certificate is attached to each and every box, bundle, or package of trees, etc., they shall not be accepted for transportation.

11. Transportation companies shall immediately notify the State entomologist (Atlanta, Ga.) when, by oversight, negligence, or otherwise, any shipment of uncertified stock is received at any station or wharf in the State, and it shall be his duty to proceed as speedily as possible to investigate and dispose of such stock, as provided for in the act cited above.

12. All trees, shrubs, or other plants commonly known as nursery stock (with the exception of conifers and strawberry plants) offered for sale, sold, or given away in this State shall be fumigated with hydrocyanic-acid gas by the owner under the direction of the State entomologist. Each and every nurseryman within this State growing nursery stock for sale shall construct and maintain upon his premises an air-tight fumigating house or box and shall maintain such fumigatorium in first-class condition for fumigating nursery stock between the first of August of each year and the first day of May following. Said fumigating house or box shall be regularly inspected by the State entomologist or his assistant in connection with the inspection of nurseries, and the owner of each nursery shall be required to demonstrate to the inspector that he has a practical working knowledge of fumigating methods. Upon failure of the fumigating house or box to pass a satisfactory inspection at the time the nursery is inspected each year, no certificate shall be granted until such fumigatorium has been placed in condition for properly fumigating nursery stock. The expenses of the inspector when making an inspection of such fumigating house after its repair or alteration shall in all cases be paid by the nurseryman. Upon failure of any nurseryman or dealer in nursery stock to comply with these requirements certificate shall be withheld or cancelled.

13. Certificate tags of a standard size shall be secured through the State entomologist for attaching to all shipments and deliveries of nursery stock within this State. Such tags shall bear the printed seal of the State board of entomology and the *facsimile* signature of the entomologist, and shall be furnished to nurserymen holding proper certificates at the schedule of prices given in regulation 9.

14. On and after January 1st, 1905, all nurserymen or dealers in nursery stock selling nursery stock within this State shall be required to thoroughly fumigate, in accordance with the directions furnished them by the State entomologist, all nursery stock which they may receive from points without the State before selling or delivering such stock within this State.

15. Upon the inspection of any nursery, the owner of said nursery, when ordered to do so by the State entomologist or by the inspector, shall file with the State board of entomology an affidavit to the effect that all nursery stock grown by him, or for him under contract, has been inspected, and that the inspectors have been advised of the location of all nursery stock owned, controlled, or contracted for by him. Certificate shall be withheld until such affidavit is placed on file.

16. The State entomologist is hereby authorized to publish in the form of bulletins, reports, or through the press of the State any matter pertaining to the distribution, life history, habits, and treatment of insect pests and fungous diseases, or other such matter that may be instructive or aid in the suppression of such pests.

17. The board of entomology may appoint temporary deputy inspectors, when it appears to be necessary, to assist the entomologist in the enforcement of the act cited above, and such deputy inspectors shall have full power to enter on premises and inspect and report to the State entomologist.

18. Appeals from the decision of the entomologist should be addressed to the commissioner of agriculture (Atlanta, Ga.), who will notify the appellant of the time and place of hearing such appeal.

19. The State entomologist shall be secretary of the board, and all inquiries relative to the provisions of the above-cited act and subject-matter of the same should be addressed to him at Capitol Building (Atlanta, Ga.).

REVISED REGULATIONS OF THE GEORGIA STATE BOARD OF ENTOMOLOGY RELATIVE
TO THE QUARANTINE AGAINST THE MEXICAN COTTON BOLL WEEVIL.

1. The shipment into the State of Georgia of cotton lint (loose, baled, flat, or compressed), cotton seed, seed cotton, hulls, seed-cotton and cotton-seed sacks (which have been used), and corn in the shuck from points in the States of Texas and Louisiana is hereby forbidden, unless such shipment shall be accompanied by the certificate of a State or governmental entomologist to the effect that such shipment originated in a locality where, by actual inspection, the Mexican cotton boll weevil was not found to exist.

2. Shipments of household goods, furniture, machinery, glassware, or supplies of any description from the States of Texas and Louisiana shall be admitted into the State of Georgia only when accompanied by a certificate (such certificate to be attached to waybill), as mentioned in regulation 1, and provided for by an act of the legislature of the State of Georgia approved August 15th, 1904, provided any of the articles listed in regulation 1 are included in such shipment or used as packing for any part or all of same.

3. Transportation companies shall immediately notify the State entomologist (Atlanta, Ga.) when, by oversight, negligence, or otherwise, any shipments of the nature designated in regulations 1 or 2 shall arrive at any station or wharf in this State without a proper certificate or affidavit attached; and it shall be the duty of the entomologist to proceed as speedily as possible, by himself or his assistant, to investigate such shipments. If, upon investigation, he find such shipment to be in violation of regulations 1 and 2, he shall at once order same removed from this State. Upon failure of the owner or shipper to remove said shipment within forty-eight hours after notice has been sent him by wire said shipment shall be seized and burned.

4. Shipments of the articles quarantined against by regulations 1 and 2 and by the acts of the legislature of the State of Georgia approved August 15, 1904, and August 23, 1905, shall be made through this State to points in other States only when in tight-closed cars. Such cars shall not be opened at any point while in transit through the State of Georgia.

5. Shipments of nursery stock, fruit, and truck into this State from points in the States of Texas and Louisiana shall be admitted only when none of the articles mentioned in regulation 1 are used in packing same, unless such shipment be accompanied by a certificate as mentioned in regulation 1.

6. Shipments of live stock from points in the States of Texas and Louisiana into the State of Georgia are hereby absolutely prohibited when any of the articles quarantined against are used as bedding or feed for such live stock, unless accompanied by the certificate of a State or governmental entomologist to the effect that the bedding or feed originated in a locality where, by actual inspection, the Mexican cotton boll weevil was not found to exist.

HAWAII.

ACT 44. (SESSION LAWS OF 1903.)

AN ACT to provide for the encouragement and protection of agriculture, horticulture, and forestry.

Be it enacted by the legislature of the Territory of Hawaii:

SECTION 1. Whenever in this act the word "board" is used, it shall refer and mean the board of commissioners of agriculture and forestry by this act provided for.

* * * * *

SEC. 5. It shall be the duty of the board:

* * * * *

(3) *Rules and regulations.* To make rules and regulations, and to amend the same from time to time in their discretion, subject to the approval of the governor, for and concerning the introduction, transportation, and propagation of trees, shrubs, and plants and the preservation, protection, extension, and utilization of forests and forest reserves, both natural and artificial; for the quarantine, inspection, fumigation, disinfection, exclusion, or destruction, either upon introduction into this Territory or at any time or place within the Territory, of any soil, nursery stock, tree, sugar cane, shrub, plant, flower, vine, cutting, graft, cion, bud, seed, root, fruit pit, fruit, vegetable, leaf, nut, or other vegetable growth or other substances, and any box, barrel, package, or packing material, or containers in which said articles, or any of them, have been transported or contained which is or may be infected with or liable to assist in the transmission or dissemination of any insect, blight, scale, or disease injurious or liable to become injurious to trees, plants, or other vegetation of value.

Included therein may be rules and regulations governing the shipping between the different islands of this Territory of any or all of the nursery stock, trees, and other articles in this subsection hereinabove enumerated.

And also with power to prohibit the importation into the Territory from any or all foreign countries, or other parts of the United States, or the shipment from one island within the Territory to another island therein, of any specific article or class of articles above enumerated which are liable to introduce or disseminate, or assist in the introduction or dissemination, of any insect, blight, scale, or disease injurious or liable to become injurious to trees, plants, or other vegetation of value. All rules and regulations made as aforesaid shall have the force and effect of law.

* * * * *

(9) *Superintendent of entomological department.* To appoint a superintendent of entomology, who shall have charge, direction, and control (subject to the direction and control of the board) of all matters relating to the exclusion or eradication of insects, scales, blights, and diseases injurious or liable to become injurious to trees, plants, or other vegetation of value; and relating to the quarantine, inspection, disinfection, exclusion, or destruction of any plant, article, or substance injurious or liable to become injurious to trees, plants, or

other vegetation of value mentioned in or coming within the scope of this act, and of such other matters as the board may from time to time direct, and who shall be paid such salary as may be appropriated by the legislature.

The said superintendent of entomology shall be a trained and educated entomologist, who has made the subject of entomology as related to agriculture a special study; and, if such a man is available, one who has had practical training and experience in connection with entomology in a tropical country.

* * * * *

SEC. 13. No soil, nursery stock, tree, sugar cane, shrub, plant, flower, vine, cutting, graft, cion, bud, seed, root, fruit pit, fruit, vegetable, leaf, nut, or moss shall be imported into the Territory of Hawaii except in the manner and upon the terms and conditions hereinafter set forth, viz:

(1) *Labels.* A label shall be affixed to the article desired to be imported, or if it is enclosed, to the box, barrel, case, package, or other container in which it is enclosed, which label shall set forth:

- (a) The name, number or amount, and description of the said article or articles.
- (b) The locality where the same was produced.
- (c) The port from which the same was last shipped.
- (d) The name of the shipper of said article or articles.
- (e) The name of the consignee of said article or articles.

(2) *Request for inspection.* In addition to any requirements of the customs authorities concerning invoices or other formalities incident to importations into the Territory, the importer shall file a written statement with the board, signed by himself, or his agent or attorney, which shall set forth his desire to import certain articles into the Territory, which articles shall be described as follows, viz:

- (a) The name, number or amount, and description of the said article or articles.
- (b) The locality where the same was produced
- (c) The port from which the same were last shipped.
- (d) The name of the shipper thereof.
- (e) The name of the consignee thereof.

The said statement shall also contain a request that the board examine, or cause to be examined, the articles described as aforesaid, and agreeing to be and become responsible for all costs, charges, and expenses incident to the inspection, examination, fumigation, disinfection, quarantine, and care of said articles desired to be imported.

(3) *Blanks.* Suitable blanks shall be furnished by the board, upon which to make such requests, which blanks may provide for the insertion of other statements, and may contain other requirements which the board, in its discretion and under the authority herein contained to make rules and regulations, may direct.

(4) *Inspection.* Immediately upon receipt of a request for inspection, in accordance with the provisions hereinabove set forth, or as soon thereafter as reasonably practicable, an inspector of the board shall inspect the said article desired to be imported.

(5) *Place of inspection.* The said inspection may, in the discretion of the said inspector, be made on the vessel importing the same, on the wharf adjacent thereto, or any other convenient place or places which he may indicate; but said article or articles shall in no case be removed from the vessel importing the same except upon a written permit signed by said inspector.

(6) *Unpacking or removing.* If, in the discretion of said inspector, it is nec-

essary, advisable, or proper, in order to more fully inspect the said articles, to unpack the said articles, or any of them, or to remove them, or any of them, to any other place or places, he shall have authority so to do at the expense of the importer.

(7) *Permit to import.* If, upon inspection as aforesaid, or at any time thereafter, if the said article or articles are held for further examination, the said inspector shall be satisfied that the said articles desired to be imported, or certain of them, are free from insects, blight, scale, and diseases injurious, or liable to become injurious, to trees, plants, or other vegetation of value, he shall give the importer a certificate of inspection, setting forth the date of the inspection or inspections, a description of the articles inspected, and permitting them to be imported into this Territory.

(8) *Disinfection or quarantine.* If, in the opinion of said inspector, it shall be necessary or proper, for the better securing of the objects of this act, to fumigate, disinfect, or quarantine said article or articles, or any of them, he shall have authority so to do, at the expense of the importer.

If, in the opinion of said inspector, it shall be necessary or proper to hold said article for continued observation or treatment, in order to be certain that no infection as aforesaid exists, or that any infection which exists or may exist therein may be eradicated, said inspector may so hold said article or articles in quarantine for said purpose or purposes.

(9) *Destruction of plants, etc.* If said inspector shall at any time, either upon said first inspection or at any time thereafter while the said article or articles are being held as aforesaid, find that the same or any of them, are infected with or contain any insect, blight, scale, or disease injurious, or liable to become injurious to trees, plants, or other vegetation of value, he shall, in his discretion, destroy the same or hold the same for further treatment.

(10) *What constitutes importation.* The landing of any article as aforesaid, for the purpose of inspection or quarantine, shall not be, nor be construed to be, an importation for the purpose of giving to the article or articles so landed any status, or the owner thereof any rights or privileges incident to the articles which have been imported into the Territory; but in legal effect the articles so landed for purposes of inspection shall be construed to still be without the Territory, seeking entry into the Territory, and shall not, in whole or in part, be entitled to be imported into this Territory until a permit so to do, as aforesaid, shall have been issued by the board or officer or inspector thereof.

(11) *Exceptions to right to import.* Nothing in this act contained shall permit the importation of any article, or class of articles, or any article or class of articles from any particular place, if the same, or any of them, have, by special rule or regulation of the board, as hereinbefore provided, been prohibited from importation into this Territory.

(12) *Port of importation of plants.* No nursery stock, soil, tree, sugar cane, shrub, plant, flower, vine, cutting, graft, scion, bud, seed, root, leaf, nut, moss, or other vegetable growth (except hay, grain, fruit, vegetables, and nuts for immediate consumption) shall be imported into the Territory of Hawaii, saving and excepting through the port of Honolulu only.

SEC. 14. No soil, sand, or rocks or stone having soil adhering thereto, brought to this Territory as ballast or separate from the roots of plants, trees or other vegetation, except such as are suitable for, and intended to be used as or in the manufacture of fertilizer, or for building, mechanical, or monumental purposes, shall be allowed to be landed in this Territory. If any vessel comes to this Territory with soil, sand, rocks, or stones having soil adhering thereto on board as ballast or in bulk, and it is desired to remove the same, it shall, except as aforesaid, be dumped at sea.

No soil or sand brought to this Territory in connection with or around the roots of plants, trees, or other vegetation, or rocks or stones with soil or sand adhering to them, shall be allowed to be imported into this Territory until the same shall have been removed to a suitable place for inspection and quarantine, and there held for such length of time as, in the discretion of the board or its officers or agents, shall be necessary to prove that it is not infected with insects, blights, scales, or diseases injurious to trees, plants, or other vegetation of value.

SEC. 15. The board shall, with the approval of the governor, adopt a reasonable scale of charges, which may be changed from time to time, for the inspection, disinfection, fumigation, and quarantine authorized, required, or permitted by this act. Certificates and permits herein provided for concerning articles imported, or proposed to be imported, into this Territory, and the charges so provided for shall be paid for in advance before any certificate or permit is delivered or any of said articles are permitted to be landed. If thereafter further expense is incurred in the inspection, treatment, or quarantine of any of said articles, the charges therefor shall be paid before any of said articles shall be delivered.

SEC. 16. Any person violating any of the provisions of this act, and any master of any vessel which shall bring into this Territory any article which the board shall at any time prohibit from being imported into this Territory; and the master of any vessel from which shall be landed any article in this act required to be inspected, until he shall have received a permit to land the said articles from the board or its officer or inspector, as herein provided, shall be guilty of a misdemeanor, and shall be punished by a fine not to exceed \$500, or imprisonment as aforesaid, in the discretion of the court.

SEC. 17. Any person who shall feel aggrieved at any decision of any inspector of the board shall have the right to appeal from such decision to the board. The board shall give a prompt hearing to the appellant and the inspector upon such appeal, and decide the question at issue, which decision shall be final.

RULES AND REGULATIONS PROHIBITING THE INTRODUCTION OF CERTAIN FRUITS AND ANIMALS INTO THE TERRITORY OF HAWAII.

RULE I.

SECTION 1. For the purpose of preventing the introduction into the Territory of Hawaii of fruit flies, their larvæ or pupæ and other insects injurious or liable to become injurious to trees, plants, fruit, or other vegetation of value, all persons, companies, and corporations are hereby prohibited from introducing or importing into the Territory of Hawaii, or into any of its ports for the purpose of debarkation into the said Territory, any fresh fruit from East or West Indies, Asia, Australasia, Oceanica, Malaysia, Mexico, Central and South America.

SEC. 2. If any fresh fruit shall be imported or introduced into the Territory of Hawaii, or into any of its ports, for the purpose of debarkation into said Territory, contrary to law or this regulation, the same shall, in the discretion of the board of commissioners of agriculture and forestry, or its duly authorized agent, officer, or inspector, be immediately destroyed or deported at the expense of the importer or introducer, and the person or persons or corporation introducing or importing the same shall be guilty of a misdemeanor and shall be liable to the penalty or penalties provided by law.

SEC. 3. This regulation shall take effect from and after the approval thereof by the governor.

Approved October 25, 1904.

RULE II.

SECTION 1. For the purpose of preserving and protecting the forests and the agricultural and horticultural interests of the Territory of Hawaii, all persons, companies, and corporations are hereby prohibited from importing or introducing into the Territory of Hawaii, or into any of its ports, for the purpose of debarkation into the said Territory, any live animal or animals known as "flying fox" (*Pteropus*) or "fruit-eating bat," or any crustacean known as "land crab," or any other animal, bird, reptile, or insect injurious, or liable to become injurious, to forests, trees, plants, or other vegetation of value.

SEC. 2. If any animal, bird, reptile, or insect is imported or introduced into the Territory of Hawaii, or into any of its ports, for the purpose of debarkation into the Territory of Hawaii, contrary to law or this regulation, the same shall, in the discretion of the board of commissioners of agriculture and forestry, or its duly authorized agent, officer, or inspector, be immediately destroyed or deported at the expense of the importer or introducer, and the person or persons or corporation introducing or importing the same shall be guilty of a misdemeanor and shall be liable to the penalty or penalties provided by law.

SEC. 3. This regulation shall take effect from and after the approval thereof by the governor.

Approved October 25, 1904.

IDAHO.

AN ACT to create and define the duties of a State board of horticultural inspection and the appointment of a State horticultural inspector and deputies; to appropriate money for their expenses, and defining the duties thereof; to prevent the gift, sale, distribution, transportation, importation, or planting of infested trees, vines, plants, cuttings, scions, grafts, pits, buds, or other articles, and to provide for the disinfection or destruction of the same; to provide for the extirpation of insect pests or fungus diseases found on trees, shrubs, vines, plants, fruit; to provide penalties for failure to comply with the provisions of this act.

SECTION 1. There is hereby created the State board of horticultural inspection, which board shall consist of five members as follows: The director of the experiment station and the professor of zoology of the University of Idaho shall be ex officio members of said board, and the other three members shall be appointed by the governor of the State as soon as may be after the passage of this act, and shall hold their office for a term of three years, or until their successors are appointed and qualified, and in making said appointments the governor shall consider the recommendations of the State horticultural society as to the proper persons to appoint: *Provided*, That of the three members first appointed after the passage of this act, one shall hold his office for one year, one for two years, and one for three years from the date of his appointment.

SEC. 2. Before entering on the duties of his office each member of said board shall take and subscribe the official oath prescribed for State officers, which oath shall be filed in the office of the secretary of state.

SEC. 3. Said board shall meet immediately after the passage and approval of this act, when it shall elect a president and a secretary from its number, who shall hold their office during the pleasure of the said board. The secretary shall perform such duties as may be prescribed by the board, and shall receive such compensation as the board may establish, not exceeding \$350.00 per annum.

Said board shall meet annually at such times and at such places as it may determine.

SEC. 4. The board shall appoint a State horticultural inspector, whose jurisdiction shall extend throughout the State, and shall fix his salary at not less than \$900 per annum. They shall also divide the State into not more than ten districts, and the State horticultural inspector shall appoint, subject to the confirmation of the board, a deputy State horticultural inspector for each district so established if necessary. The persons so appointed shall be especially qualified for their position by reason of a practical knowledge of horticulture and the pests incident thereto. Their jurisdiction shall be limited to their respective districts. Said inspectors shall hold their office during the pleasure of said board. Said board shall make an estimate of the amount of money available for each district for each year, and no inspector shall incur any expense in the discharge of his duties in excess of said estimate furnished him by said board. The aggregate sum of all the estimates furnished to the various inspectors in any one year must in no case exceed the amount available for carrying out this act for such year.

SEC. 5. Each inspector so appointed shall receive as compensation for his services as such inspector the sum of five dollars per day for each day actually and necessarily employed in the discharge of his duties as prescribed in this act. Such compensation shall be paid out of the general fund of the State, upon warrants duly drawn by the State auditor, only after the bills presented for such services shall have been audited and approved by the secretary and a majority of said board and audited as other bills against the State of Idaho.

SEC. 6. It shall be the duty of said inspectors, or State inspector, either on their own motion, or upon the complaint of interested parties, to enter and make, or cause to be made, inspection of any field, rights-of-way, of any irrigation canals, or railways, public highways, fields, orchards, nurseries, fruit packing houses, storerooms, sales-rooms, depots, or other places where fruits are grown or stored, and of fruits, trees, vines, plants, shrubs, or other articles within the State, supposed to be, or liable to be, infested with pests, or with their eggs or larvæ, or infested with any contagious diseases injurious to fruits, plants, trees, shrubs, vines, as hereinafter provided. If upon any inspection there be found any disease, or pests, eggs, or larvæ of any pests injurious to fruits, plants, trees, shrubs, or vines, the inspector shall notify the owner or owners, or the person or persons in charge or in possession of said places, fields, orchards, nurseries, trees, plants, shrubs, vines, fruits, or other articles as aforesaid; the inspector shall require such person or persons to eradicate or destroy said injurious pests or insects, or their eggs or larvæ within a reasonable time, to be specified. Said notice shall be served in person or in writing on said person or persons, or either of them, owning or having in charge such infested places, rights-of-way, fields, orchards, nurseries, trees, shrubs, vines, plants, fruits, or other articles as visited by the inspector, or it may be served in the same manner as the summons in a civil action. If the owner or owners, or person or persons in charge or in possession, of any highway, rights-of-way of canal or railways, fields, orchards or nurseries, or trees or plants, or other articles infested with any insect, or their eggs or larvæ, or any disease injurious to any trees, fruits, vines, shrubs, plants, or any other articles infested, after having been notified, as above, to eradicate and destroy the same, shall fail, neglect, or refuse so to do, then any and all such places, public highways, rights-of-ways, fields, orchards, nurseries, trees, plants, vines, fruit, or other articles thus infested are adjudged and declared to be a public nuisance and shall be proceeded against as such; and whenever any such nuisance shall exist at any place in the State or on the property of any non-resident, or on any highway, rights-of-way, or fields as aforesaid, or on any property the owner or owners of which can not be found

within the State or on any property where notice has been served as aforesaid and where the owner or those in possession shall refuse or neglect to abate such nuisance within the time specified, it shall be the duty of the district inspector within the county wherein the nuisance is to be abated, or State inspector, or either of them, and he is hereby empowered to cause said nuisance to be abated at once by eradicating or destroying all said pests or their eggs or larvæ, or by disinfecting or destroying all fruits, trees, vines, plants, shrubs, pits, scions, or other articles upon which said fungous diseases or pests or their eggs or larvæ may be found. The expense of such proceedings shall be paid out of the general fund of the State in the same manner as set forth for paying said inspectors. All sums so paid shall be collected from the parties owning said real estate on which said nuisance was situated by civil suit in the name of the board herein created, and it shall be the duty of the county attorney of the county in which said real estate is situated to bring suit, and said sum, when collected, shall be paid into the State treasury.

SEC. 7. The inspectors are hereby vested with all the necessary authority to enforce quarantine against any infested fields, lots, rights of way, orchards, nurseries, trees, plants, buds, scions, or any other place or article within the State when the same may be liable to spread contagious diseases injurious to fruit or trees or fruit crops of any kind, and to provide necessary rules and regulations to govern the same.

SEC. 8. No person, firm, or corporation shall hereafter engage in or continue in the business of importing and selling within the State any fruit trees, forest trees, vines, plants, shrubs, scions, pits, or other nursery stock without first making an application therefor to the State board of horticultural inspection, which said application in writing shall be accompanied with a good and satisfactory bond in the sum of one thousand dollars to be approved by the State board of horticultural inspection, conditioned for the faithful observance of all of the provisions of this act and of the laws of the State of Idaho by said applicant or applicants and their agents and representatives. As soon as said application is received and said bond approved, it shall be the duty of said board of horticultural inspection to issue a certificate to such applicant or applicants with the provisions of this section, and thereafter the said applicant or applicants shall be authorized and permitted to carry on said business within the State of Idaho.

SEC. 9. No person, firm, or corporation, after importing into the State any fruit trees, forest trees, vines, plants, shrubs, scions, pits, or other nursery stock, shall sell or offer for sale or dispose of the same without first thoroughly fumigating the same with hydrocyanic gas, unless said fruit trees, forest trees, vines, plants, shrubs, scions, pits, or other nursery stock be accompanied by a certificate from a competent person duly authorized by law in the State, Territory, or District wherein said stock was grown showing that the said stock had been properly fumigated or disinfected by hydrocyanic gas before being shipped.

SEC. 10. Any person, persons, firm, or corporation, his or their agents, who shall bring or import into the State fruit trees, forest trees, vines, plants, shrubs, scions, pits, or other nursery stock with intent to sell or dispose of the same without first making application to the State board of horticultural inspection, filing the necessary bonds, and securing the certificate provided for in section 8 of this act, or who, having imported said fruit trees, forest trees, vines, plants, shrubs, scions, pits, or other nursery stock into the State with the intent to sell or dispose of the same, or any part thereof, without first notifying the State horticultural inspector or the deputy district inspector thereof, or having the

said fruit trees, forest trees, vines, plants, shrubs, scions, pits, or other nursery stock fumigated, as provided in section 9 of this act, or where found infested shall fail or refuse to destroy or disinfect the same, shall be deemed guilty of a misdemeanor and, upon conviction thereof, shall be punished as provided by section 14 of this act.

SEC. 11. All peach, nectarine, apricot, plum, prune, almond, or other trees budded or grafted on peach stock or roots; all peach or other pits, cuttings, buds, or scions raised or grown in a district where "peach yellows" or "peach rosette" is known to exist are hereby prohibited from being offered for sale, gift, distribution, transportation, or planting within the State of Idaho. Any person or persons, dealers, shippers, transportation companies, or their agents who shall be in the possession of any such property for any purpose shall, when required by the inspector, burn the same without delay.

SEC. 12. Fruit of any kind, trees, plants, shrubs, cuttings, grafts, buds, seeds, scions, pits, or any articles of any kind grown in any foreign country or in any of the United States or Territories infested by any insect or insects or their eggs or larvæ, or by any fungous diseases or their germs known to be injurious to fruit or fruit trees, or other trees, plants, vines, shrubs, or other articles liable to spread contagion, are hereby prohibited from being offered for sale, gift, distribution, transportation, or planting in any county in this State, unless the same shall have been examined by the State inspector, or his deputy for such district, and, if found diseased or infested, shall have been thoroughly disinfected in such manner as may be required by the inspector, the owner to pay the expense of such disinfection.

SEC. 13. Any person or persons shipping fruit trees, or trees of any kind, shrubs, vines, scions, cuttings, or plants within the State shall affix to each package, bundle, or parcel containing the same a distinct mark, stamp, or label showing the name of the shipper or grower, the locality where grown, and the variety of said trees, shrubs, vines, grafts, scions, cuttings, plants, or buds; also any person or persons or corporation, his or their agents, selling or offering for sale fruit of any kind, shall affix to each package a distinct mark or label showing the kind and quality of the same, the name of the shipper or grower, and the locality where grown.

SEC. 14. Any person, persons, dealers or shippers, having in their possession any fruit, trees, vines, shrubs, plants, cuttings, grafts, buds, seeds, pits, or other articles infested with any injurious insects or their germs, or with any fungus or other diseases injurious to fruit or fruit trees, shrubs, or other trees or plants, or who shall sell or offer for sale, gift, distribution, transportation, or planting, or who shall refuse to destroy or disinfect (as provided in this act or as ordered by the State inspector or by the deputy inspector in his district) the said fruit or trees, shrubs, vines, plants, cuttings, grafts, pits, scions, or other articles, or who shall refuse or neglect to attach a distinct mark or label as hereinbefore provided, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than twenty-five nor more than three hundred dollars. All sums so collected shall be paid into the State treasury.

SEC. 15. Each inspector shall make a detailed report of all his official acts to the secretary of said board on the first day of every month, which report shall be made under oath, and shall include a statement of the number of days actually and necessarily employed and miles traveled as such inspector during said month, and a detailed statement of the amount due him or to other persons, for services or expenses incurred in carrying out the provisions of this act. The secretary of said board shall audit all such bills, and shall submit them by mail to each member of said board for approval and signature. If approved by

a majority of said board, said bill shall be transmitted to the State auditor, and they shall be paid as other claims against the State.

SEC. 16. The members of the State board of horticultural inspection shall serve without compensation, but shall receive actual expenses incurred in attending meetings of the board.

SEC. 17. All county officers shall be liable on their official bond for the proper performance of any duties imposed by this act.

SEC. 18. Neglect or refusal to comply with the orders of the State inspector or his deputies, made in pursuance of the provisions of this act, shall constitute a misdemeanor, and shall be punished as provided for misdemeanors in section 14 of this act.

SEC. 19. Whereas there is great danger to the horticultural interests of the State of Idaho from pests and other causes for which no adequate remedy has been provided, an emergency existing, therefore this act shall take effect from and after its passage and approval by the governor.

SEC. 20. All acts and parts of acts in conflict with this act are hereby repealed.

ILLINOIS.

AN ACT to prevent the introduction and spread in Illinois of the San Jose scale and other dangerous insects and contagious diseases of fruits.

SECTION 1. *Be it enacted by the people of the State of Illinois, represented in the general assembly*, That it shall be the duty of the State entomologist of Illinois to inspect, or cause to be inspected by his duly appointed assistants, once each year all nurseries in the State of Illinois as to whether they are infested by dangerous insects or infected with contagious plant diseases, and, if upon such inspection such nurseries appear to be free from such dangerous insects or diseases, he shall, upon the payment of the expenses of inspection as certified by him, give to each owner of such nursery or nurseries a certificate to the facts, and shall file duplicate certificates with the director of the State agricultural experiment station and with the secretary of the State horticultural society, which certificates shall be at all times subject to public inspection. Whenever a nurseryman or seller of trees, vines, plants, or other nursery stock within this State shall ship or deliver any such stock he shall place and send on each package so shipped or delivered a copy of a certificate, the original of which is signed by a State or Government inspector, stating that such stock has been inspected and has been found apparently free from dangerous insects or contagious plant diseases, and the use of such certificate in connection with nursery stock any and every part of which has not been inspected and certified as aforesaid shall render the owner of such stock liable to the penalties prescribed for a violation of this act.

§ 2. It shall further be the duty of the State entomologist to inspect, or to cause to be inspected, from time to time, any nursery, orchard, fruit plantation, or other property or place in this State which he shall have reason to suppose to be infested by dangerous insects or infected with contagious plant diseases, and for the purpose of such inspection he and his assistants are authorized, during reasonable business hours, to enter into or upon any farm, orchard, nursery, garden, storehouse, or other building or place used for the growing, storage, packing, or sale of trees, plants, or fruits; and if the State entomologist shall find by inspection as aforesaid that any nursery, orchard, or garden or other property or place is infested by the San José scale or other dangerous insect, or

infected with contagious plant diseases, liable to spread or be conveyed to other premises, to the serious injury of the property thereon, he shall notify in writing the owner or the person in charge of such infested or infected property, and shall direct him, within a time and in a manner prescribed in such notice, to use such measures as shall prevent the conveyance or spread of such insects or disease to the property of others, and such infested or infected property shall not be removed after the owner or person in charge of the same shall have been notified in writing as aforesaid without the written permission of the entomologist. If the person so notified shall refuse or neglect to treat and disinfect said premises or property in the manner and within the time prescribed in said notice, it shall be the duty of the State entomologist to cause such property or premises to be so treated, and he shall certify to the owner or person in charge of the premises one-half the amount of the cost of treatment, and if not paid to him within sixty days thereafter the same may be recovered, together with the cost of action, before any court in the State having competent jurisdiction: *Provided*, That any orchard property found infested by the San José scale which the State entomologist has good reason to believe became so infested before the year 1899 shall be once thoroughly treated and disinfected by the entomologist without charge to the owner of said infested property: *And further provided*, That any part of such property which may, in the judgment of the entomologist, be so badly infested by the San José scale as to be worthless may be destroyed by him or his assistant without liability for compensation to the owner thereof, and if he should find that such orchard or fruit plantation or other property or place in this State is not so infested, that he shall be required to give the owners thereof a certificate to that effect without charge.

§ 3. Whenever any trees, shrubs, plants, or vines are shipped into the State from some other State, country, or province, every package thereof shall be plainly labeled on the outside with the name of the consignor, the name of the consignee, and a certificate showing that the contents have been inspected by a State or Government officer, and that the trees, vines, shrubs, or plants therein contained appear free from all dangerous insects or diseases. Whenever any trees, shrubs, vines, or plants are shipped into this State without such certificate plainly fixed on the outside of the package, box, or car containing the same, the facts must be reported within twenty-four hours to the State entomologist by the railway, express, or steamboat company, or other person or persons carrying the same, and it shall be unlawful to deliver any such property until it has been inspected by the State entomologist or his assistants and by him or them certified to be free from dangerous insects or contagious diseases. Any agent of any railway, steamboat, or express company, or other person or persons carrying such property as aforesaid, who shall fail to give such notice as above required shall be deemed guilty of a violation of this act. When nursery stock is shipped into this State accompanied by a certificate, as herein provided, it shall be held prima facie evidence of the facts therein stated, but the State entomologist, by himself or his assistants, when they have reason to believe that any such stock is infested with dangerous insects, or is infected with contagious diseases, shall be authorized to inspect the same and subject it to like treatment as provided in section 2 of this act.

§ 4. Any person violating or neglecting to carry out the provisions of this act, or offering any hindrance to the carrying out of this act, shall be adjudged guilty of misdemeanor, and, upon conviction before a justice of the peace, shall be fined not less than ten dollars and not more than one hundred dollars for each and every offense, together with all the costs of the prosecution, and shall stand committed until the same is paid. It shall be the duty of the State's attorney

to prosecute all violations of this act, and all amounts so recovered shall be paid over to the treasurer of the State.

§ 5. The office of the State entomologist shall be established at the University of Illinois, the trustees of which shall provide for him and his assistants such office and laboratory rooms as may be necessary to the performance of their duties. He shall have power to appoint such qualified assistants as may be necessary to the execution of this act, who shall be competent, scientific, and practical entomologists, and to fix a reasonable compensation for their labor, and their acts, done in pursuance of his instructions, shall have the same validity as his own. He shall pay over to the State treasurer all the funds coming into his hands under the provisions of section 2 of this act, with an itemized statement of the sources whence received. He shall certify to the State auditor the amount of his expenses and of those of his assistants, and of the salaries of his assistants employed under this act, less the sums received under section 1 of this act, and the auditor shall thereupon draw his warrant upon the State treasurer for the amount, which shall be paid out of the funds provided for carrying this act into effect. The State entomologist shall make to the governor a biennial report of his operations under this act, together with a financial statement in detail as a part of his report as State entomologist, and he shall also make each year to the State Horticultural Society, at its annual meeting, a statement showing the Illinois nurseries inspected, the number and kinds of certificates issued, the location and ownership of the premises treated or disinfected by him or his assistants, the kinds and amount of property destroyed by him in pursuance to this act, and such other facts concerning the operations of his office under this act as the executive committee of said horticultural society may request.

§ 6. There is hereby appropriated to the State entomologist for the salaries of assistants and for expenses incurred under this act the sum of eight thousand dollars (\$8,000) for the years 1899 and 1900, or so much thereof as may be necessary. The auditor of public accounts is hereby authorized to draw his warrant upon the State treasurer against the sums herein appropriated upon the presentation of proper vouchers, and the State treasury [treasurer] shall pay the same out of any funds in the public treasury.

§ 7. Whereas an emergency exists, therefore this act shall take effect and be in force from and after its passage.

Approved April 11, 1899.

INDIANA.

CHAPTER 138, GENERAL LAWS OF 1899.

AN ACT to provide for the inspection of nursery stock and to prevent the dissemination of the San Jose scale and other dangerously injurious insects and plant diseases, and for the appointment of a State entomologist, defining his powers, prescribing his duties, and fixing his compensation; also defining the crimes for the violation of this act, and prescribing the punishment therefor, and making an appropriation for the same, and declaring an emergency.

SECTION 1. *Be it enacted by the general assembly of the State of Indiana,* That all nurseries in Indiana where trees, shrubs, vines, plants, or other nursery stock are grown and offered for sale, shall be inspected by the State entomologist at least once each year, not earlier than June 1 nor later than October 1, at such times as he may elect, and he shall notify in writing the owners of

such nurseries, the secretary of the State board of agriculture, the director of the State agricultural experiment station, and the president of the State horticultural society of the presence of any San Jose scale or other destructively injurious insect or fungi on trees, shrubs, vines, plants, or other stock of such nurseries, and shall notify in writing the owner of any affected stock that he is required on or before a certain day to take such measures for the destruction of such insects or fungus enemies of nursery stock as have been shown to be effectual for this purpose.

SEC. 2. For the purpose of carrying this act into effect the governor is hereby authorized to appoint a State entomologist, who shall hold office for four years, unless sooner removed by the governor for cause, whose duty it shall be to inspect nursery stock and other plants, as provided for in this act, and the said State entomologist or his assistants are hereby empowered with authority to enter upon any premises and examine all plants whatsoever in discharge of the duties herein prescribed.

SEC. 3. Any person or persons who shall obstruct or hinder said State entomologist or his assistant in the discharge of their duties shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than ten or more than twenty-five dollars.

SEC. 4. [Refers to the compensation of the State entomologist.]

SEC. 5. The owner of any affected nursery stock shall, within the time specified, take such steps for the destruction of San Jose scale or other destructively injurious insects or fungus enemies present as will exterminate the same, and it shall be a misdemeanor to ship or deliver any of such stock, punishable by a fine of twenty-five dollars (\$25) for every such offense, the fine recoverable before a justice of the peace, or by indictment of the grand jury of the county in which the nursery is situated, or of that to which such stock may have been shipped.

SEC. 6. Whenever a nurseryman or seller of trees, shrubs, vines, plants, or other nursery stock, who is a resident of this State, shall ship or deliver any such goods, he shall send on each package so shipped or delivered a written or printed certificate stating that such stock has been examined by a State or Government entomologist and found, to the best of his knowledge and belief, to be free from San Jose scale or other destructively injurious insects or fungus enemies. Failure to furnish such certificate or furnishing a false certificate shall render him liable to the penalty of a fine of twenty-five dollars (\$25.00) for each and every shipment or delivery without such certificate.

SEC. 7. When the State entomologist or his assistant examines any trees, shrubs, vines, plants, or other nursery stock in this State, under the provisions of this act, and finds such nursery stock apparently free from San Jose scale and other destructively injurious insect and fungus enemies, he is hereby authorized and directed to make out and deliver, in writing, to the owner of such stock a certificate stating that he has inspected such stock and found the same to be apparently free from San Jose scale and other destructively injurious insect and fungus enemies, and he shall file similar certificate with the secretary of the State board of agriculture, the president of the State horticultural society, and the director of the State agricultural experiment station, which certificates shall at all times be subject to public inspection.

SEC. 8. Whenever a nurseryman, fruit grower, or agriculturist in this State shall know or have good reasons to believe that his trees, shrubs, vines, or plants are affected with San Jose scale, yellows, rosette, or other destructive insects or fungus enemies, he shall have the privilege, and it shall be his duty, to notify the State entomologist, who shall proceed in person or by his assistant to ex-

amine the same without delay and advise the proper remedies for the destruction of such insect or fungus enemies that may be present. In case the owner or owners or persons in control of said affected trees, shrubs, vines, or other plants do not apply the proper remedies recommended by the said State entomologist within a certain specified time, said owner or owners or persons in control of, shall be liable to a fine of not more than twenty-five dollars (\$25) nor less than ten dollars (\$10) and costs, in the judgment of the court, for every such offense, the fine to be recoverable in the same manner as that provided for in section 5 of this act: *Provided*, That in case of an objection to the findings of the State entomologist an appeal may be taken to the circuit court of the proper county, whose decision shall be final; said appeal must be taken within three days and shall operate as a stay of proceedings until it is heard and decided.

SEC. 9. Every package of trees, shrubs, vines, plants, or other nursery stock shipped into this State from another State shall be plainly labeled on the outside with the name of the consignor, the name of the consignee, and a certificate bearing the current year's date, signed by a State or Government inspector, showing that the contents have been examined by him and that, to the best of his knowledge and belief, such stock is free from San Jose scale or other destructive insect or fungus enemies.

SEC. 10. Whenever any trees, shrubs, vines, or other plants are shipped into this State without such certificate plainly fixed on the outside of the package, box, or car containing the same, the fact must be reported within twenty-four hours to the State entomologist by the agent of the railway, express, or steamboat company or other person or persons carrying or receiving the same, and any agent of any railway, express, or steamboat company or mail carrier, or any other person or persons who shall violate the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than twenty-five (\$25) nor more than one hundred dollars (\$100) and costs, or imprisonment in the county jail not less than five (5) nor more than thirty (30) days, or may be so fined and imprisoned in the discretion of the court, and any such fines collected under the provisions of this act shall be paid over to the State treasurer. On notification of the receipt of such uncertified package or packages of trees, shrubs, vines, or other plants, the State entomologist shall examine or cause to be examined said package or packages at the expense of the express, railway, steamboat companies or other person or persons carrying the same, and if found to be free from all injurious insects and plant diseases, he may allow them to pass to their destination; otherwise he shall cause the same to be burned and destroyed. But in no case shall the agent of the railway or other transportation company allow said package or packages to pass out of his possession under penalty until the same has been duly inspected by the State entomologist or his agent.

SEC. 11. [Refers to the appropriation for carrying the laws into effect.]

IOWA.

AN ACT to prohibit the bringing into the State of any nursery stock infested with the San Jose scale; to provide for the punishment thereof, and to prevent the spread of the scale within the State. [Additional to Title XII of the Code, pertaining to the police of the State.]

Be it enacted by the general assembly of the State of Iowa:

SECTION 1. *State entomologist—Assistants—Fees.* The entomologist of the State experiment station is hereby constituted the State entomologist and charged with the execution of this act. He may appoint such qualified assistants

as may be necessary, fix a reasonable compensation for their labor, and pay the same, and their acts shall have the same validity as his own. He shall, by himself or his assistants, between the first day of June and the fifteenth day of September, in each year, when requested by the owner or agent, or where he has reasonable grounds to believe the scale exists, carefully examine any nursery, fruit farm, or other place where trees or plants are grown for sale, and if found apparently free from the scale he shall issue his certificate stating the facts, and shall collect therefor a fee of not less than five dollars nor more than fifteen dollars, according to the amount of stock inspected. It shall be unlawful to sell or offer for transportation any nursery stock outside the county where said nursery stock is grown, unless accompanied by a copy of this certificate.

SEC. 2. *Quarantine—Treatment—Collection of cost.* The State entomologist shall have authority, when requested by the owner or agent or when he has reasonable grounds to believe the scale exists, to enter upon any grounds, public or private, for the purpose of inspection, and if he finds any nursery, orchard, garden, or other place infested by the scale he may, by himself or his assistants, enter upon such premises and establish quarantine regulations.

If, in his judgment, the scale may be eradicated by treatment he may, in writing, order such treatment, and prescribe its kind and character. In case any trees, shrubs, or plants are found so infested that it would be impracticable to treat them he may order them burned. A failure for ten days after the delivery of such order to the owner or persons in charge to treat or destroy such infested trees or plants, as ordered, shall authorize the entomologist to perform this work by himself or his assistants, and to ascertain the cost thereof. He shall certify the amount of such cost to the owner or person in charge of the premises, and if the same is not paid to him within sixty days thereafter he shall certify the amount to the county auditor, who shall spread the same upon the tax books, to be collected as other taxes are, and turned over to the entomologist to become a part of the fund for carrying this act into effect.

SEC. 3. *Inspection of nursery stock shipped into State.* Where nursery stock is shipped into this State, accompanied by a certificate, as herein provided, it shall be held prima facie evidence of the facts therein stated, but the State entomologist, by himself or his assistants, when they have reason to believe such stock is infested with the scale, shall be authorized to inspect the same and subject it to like treatment, as provided in section two of this act.

SEC. 4. *Certificate of inspection—Penalties.* It shall be unlawful for any person, firm, or corporation to bring into the State any trees, plants, vines, cuttings, and buds, commonly known as nursery stock, unless accompanied by a certificate of inspection by a State entomologist of the State from which the shipment was made, showing that the stock has been inspected and found apparently free from the scale. Any person violating or neglecting to carry out the provisions of this act, or offering any hindrance to the carrying out of this act, shall be adjudged guilty of a misdemeanor, and upon conviction before a justice of the peace shall be fined not less than ten dollars nor more than one hundred dollars for each and every offense, together with all the costs of the prosecution, and shall stand committed until the same are paid. All amounts so recovered shall be paid over to the State entomologist and added to the fund herein provided for carrying out the provisions of this act.

SEC. 5. *Compensation.* The State entomologist shall be allowed and paid for his services while engaged in this work all his necessary traveling expenses and the sum of \$5 per day. All funds coming into his hands shall be paid over to the State treasurer, with an itemized statement of the source whence received. He shall certify the amount of his expenses and per diem to the auditor of

state, who shall thereupon draw his warrant upon the treasurer of state for the amount, which shall be paid out of the funds provided for carrying this act into effect.

SEC. 6. *Appropriation.* There is hereby appropriated out of any money not otherwise appropriated the sum of one thousand dollars (\$1,000), or so much thereof as may be necessary for carrying out the provisions of this act.

Approved, April 12, 1898.

KANSAS.

There is at present no law in Kansas relating to the control of injurious insects.

KENTUCKY.

LAWS OF 1897.

AN ACT to provide for the inspection of nursery stock and to prevent the dissemination of noxious insects and fungi.

§ 1. That all nurseries in Kentucky where trees, vines, plants, or other nursery stock are grown and offered for sale shall be inspected by the entomologist and botanist of the State agricultural station once each year at such time as he may elect, and he shall notify, in writing, the owners of such nurseries, the commissioner of agriculture and statistics, the director of the State agricultural experiment station, and the president of the State horticultural society of the presence of any San Jose scale or other destructively injurious insects or fungi on the trees, vines, plants, or other stock of such nurseries, and shall also notify, in writing, the owner of any affected stock that he is required, on or before a certain day, to take such measures for the destruction of such insects or fungus enemies of nursery stock as have been shown to be effectual for this purpose. Said entomologist and botanist shall, for the purposes of this act, be, and he is hereby declared to be, the State entomologist, and shall serve without pay other than that he may receive as an officer of the State agricultural experiment station, but his expenses shall be paid as hereinafter provided.

§ 2. The owner of this affected nursery stock shall, within the time specified, take such steps for the destruction of San Jose scale or other destructively injurious insect or fungus enemies present as will exterminate the same, and it shall be a misdemeanor to ship or deliver any of such stock, punishable by a fine of fifty dollars for every such offense, the fine recoverable before a justice of the peace, or by indictment by a grand jury of the county in which the nursery is situated, or of that to which such stock may have been shipped.

§ 3. Whenever a nurseryman or seller of trees, vines, plants, or other nursery stock, who is a resident of this Commonwealth, shall ship or deliver any such goods, he shall send on each package so shipped or delivered a written certificate, signed by him, stating that the whole and every part of such stock has been examined by a State or Government entomologist and found free from San Jose scale or other destructively injurious insect or fungus enemies. Failure to furnish such certificate, or furnishing a false certificate, shall render him liable to the penalty of a fine of fifty dollars for each and every such shipment or delivery without such certificate.

§ 4. When the State entomologist examines any trees, vines, plants, or other nursery stock in this State under the provisions of this act, and finds such

nursery stock free from San Jose scale and other destructively injurious insect and fungus enemies, he is hereby authorized and directed to make out and deliver, in writing, to the owner of such stock a certificate stating that he has inspected such stock and found the same free from San Jose scale and other destructively injurious insect and fungus enemies, and he shall file similar certificates with the commissioner of agriculture and statistics and with the president of the State Agricultural and Mechanical College, which certificates shall at all times be subject to public inspection.

§ 5. Whenever a nurseryman, fruit grower, or agriculturist in this Commonwealth shall know or have good reason to believe that his trees, vines, or plants are affected with San Jose scale, yellows, rosette, or other destructive insect or fungus enemies, he shall have the privilege, and it shall be his duty, to notify the State entomologist, who shall proceed to the premises designated and examine the same and suggest and recommend the proper remedies for the destruction of such insect or fungus enemies as may be present.

§ 6. Every package of trees, vines, plants, or other nursery stock shipped into this State from another State shall be plainly labeled on the outside with the name of the consignor, the name of the consignee, the contents, and a certificate, signed by a State or Government inspector, showing that the contents have been examined by him, and that such stock is free from San Jose scale, or other destructive insect or fungus enemies. Whenever any trees, vines, plants, or other nursery stock are shipped into this State without such a certificate plainly fixed on the outside of each package, the fact may be reported to any justice of the peace of this Commonwealth, and said justice shall issue a summons for the consignee of such package, and the agent of the consignor, if he be known, to appear before him on a certain day, to be therein named, to show cause why such trees, vines, plants, or other nursery stock should not be seized, as being in violation of the provisions of this act, and on trial thereof, if said justice be satisfied that the provisions of this act have been violated, he shall order such agent or consignee to return such package of trees, vines, plants, or other stock immediately to the shipper or consignor, unless said consignee or agent shall forthwith, and at his own expense, have such trees, vines, plants, or other nursery stock examined by the State entomologist, or such person as he may appoint to make the examination, and he certifies to the justice of the peace that such nursery stock is free from San Jose scale or other destructive insect or fungus enemies. If such consignee or agent fail to have such inspection made, or fail to return such packages to the shipper or consignor thereof, then the justice of the peace shall order and direct the constable or sheriff to burn and destroy, at the expense of the agent or consignee, all such trees, vines, plants, or other stock as have been shipped into this Commonwealth in violation of law.

§ 7. The sum of five hundred dollars annually, or so much thereof as may be necessary, is hereby appropriated for the purpose of paying the expenses of the State entomologist in the performance of his duties under the provisions of this act, and the auditor of public accounts is hereby directed to honor requisitions made by said State entomologist for expenses incurred in the performance of his duties, and the State entomologist shall make annual report to the treasurer of the amount expended.

§ 8. Inasmuch as the insect known as the San Jose scale has appeared in some sections of this Commonwealth, and great destruction of fruit and fruit trees is imminent, therefore an emergency is declared to exist, and the act shall take effect from and after its passage and approval by the governor.

Approved May 20, 1897.

LOUISIANA.

ACT No. 6.

AN ACT to provide for the establishment and organization of a State crop pest commission and to define the duties and powers of the same; to fix penalties for the violation of any of the rules, orders, ordinances, and regulations thereof; to make it a misdemeanor for any person, firm, or corporation to bring into this State or have in possession, except certain persons, any living Mexican boll weevil in any of its stages, and providing a penalty therefor; to provide for the publication and distribution of all the proceedings and recommendations of said commission; to authorize said commission to restrain, by injunction or otherwise, any violations, or threatened violations, of its orders, rules, ordinances, and regulations, and to prohibit any court of the State from bonding the same prior to trial on the merits; to make it the duty of the attorney-general and district attorneys to represent said commission and the sheriff to serve all papers for said commission; to provide for the payment of all fines and forfeitures for violations of the orders, rules, ordinances, and regulations of said commission to the State treasurer, and by him to be placed to the credit of said commission; to relieve said commission of the necessity of giving bond or security in any legal proceedings which it shall institute or defend in any court of justice in this State; to make an appropriation to carry out the provisions of this act and to repeal all laws or parts of laws inconsistent or in conflict with the same.

SECTION 1. *Be it enacted by the general assembly of the State of Louisiana,* That a State crop pest commission for the State of Louisiana is hereby created and established, to consist of the governor as ex officio chairman, the commissioner of agriculture, the director of the State experiment station, the station entomologist, and two experienced resident cotton planters, the latter to be appointed by the governor, and every four years thereafter, and who shall serve for four years and until their successors are duly appointed and qualified. The station entomologist and the two planters shall be commissioned and shall qualify in the same manner as provided by the constitution and laws of the State for all other officers. Said commission shall have its domicile at Baton Rouge and shall hold its first session at said place immediately after the promulgation of this act, and at such other times and places as may be designated by said commission. At any meeting of said commission any three members shall constitute a quorum to transact business. The members of said commission, not salaried under the State government, shall receive the sum of five (\$5) per day for each day consumed in going to and returning from any of the meetings of said commission, and while in attendance thereon, and necessary traveling expenses, which amount shall be paid by the State treasurer on the voucher of the member, approved by the governor, out of any funds to the credit of said commission. Said commission shall elect one of its members secretary, and shall appoint such other assistants as may be necessary to carry on the work of said commission, and shall fix their compensation.

SEC. 2. *Be it further enacted, etc.,* That for the purpose of carrying out the rules, ordinances, orders, and regulations of said commission, as hereinafter provided, the commissioner of agriculture shall be the active chairman of said commission, and as such shall see that all the rules, ordinances, orders, and regulations of the same are faithfully executed; and in addition to such duties, the active chairman shall have the power, during the interval between the meetings of said commission, and when the same is not in session, to issue all orders, and to take all necessary steps, by suit or otherwise, to execute the laws of the State on the subject-matter delegated to said commission, and to carry out the rules, ordinances, orders, and regulations of said commission made thereunder; and he may, in his discretion, call special meetings of said commission whenever, in his opinion, an emergency shall require it: *Provided,*

That in all cases where two or more members shall demand the same it shall be his duty to convene the same in special session.

SEC. 3. *Be it further enacted, etc.,* That said commission shall have full and plenary power to deal with all crop and fruit pests and such contagious and infectious crop and fruit diseases as, in the opinion of the commission, may be prevented, controlled, or eradicated; and with full power and authority to make, promulgate, and enforce such rules, ordinances, orders, and regulations, and to do and perform such acts as, in their judgment, may be necessary to control, eradicate, and prevent the introduction, spread, or dissemination of the Mexican boll weevil in the State, and all other injurious crop and fruit pests and diseases as far as may be possible, and all the rules, ordinances, orders, and regulations of said commission shall have the force and effect of law so far as they conform to the general laws of the State and the United States. Said commission, in the exercise of the power and authority hereby delegated, shall have authority to prohibit the shipment or bringing into this State of any cotton seed or other articles of farm produce, or any other article of any nature or character whatsoever from any State, Territory, or foreign country, or consigned from points within any State, Territory, or foreign country, where the boll weevil or any other infectious or contagious crop or fruit disease exists, except under such rules and regulations as may be adopted by said commission.

SEC. 4. *Be it further enacted, etc.,* That any firm, person, or corporation, except a duly recognized State or Federal entomologist, who shall bring into this State, or have in possession, for any purpose, any living Mexican boll weevil, cotton boll, square, plant, or seed containing the Mexican boll weevil, whether adult or in the pupal, larval, or egg state, shall be deemed guilty of a misdemeanor, and shall, upon conviction, be fined not less than twenty-five nor more than one thousand dollars for each offense, or be imprisoned for not less than ten days nor more than six months. Prosecutions under the provisions of this section may be instituted and carried on in any parish where any person, firm, or corporation may be found with, or shown to have had in possession, any living Mexican boll weevil, cotton boll, square, plant, or seed containing the Mexican boll weevil, whether adult or in the pupal, larval, or egg state.

SEC. 5. *Be it further enacted, etc.,* That any person, firm, or corporation violating any of the rules, ordinances, orders, or regulations of said commission shall be guilty of a misdemeanor, and shall, upon conviction thereof, be punishable by a fine of not less than twenty-five nor more than one thousand dollars, or imprisonment for not more than six months nor less than thirty days. All prosecutions under this act shall be commenced and carried on in any parish of the State affected by the violation of said orders, ordinances, rules, and regulations, and the said commission may enjoin any threatened or attempted violations of its rules, orders, ordinances, and regulations in any court of competent jurisdiction, or take any other civil proceedings necessary to carry out and enforce the purposes of this act; and no court of this State shall have the right previous to final trial to set aside said injunction on bond. It shall be the duty of the attorney-general and the various district attorneys to represent said commission whenever called on to do so; and said commission in the discharge and enforcement of the duties and powers herein delegated may send for books and papers, swear witnesses, etc.; and it is hereby made the duty of the various sheriffs throughout the State to serve all papers, summons, etc., that may be delivered to them by said commission.

SEC. 6. *Be it further enacted, etc.,* That said commission at their first session shall prepare and publish a list of dangerous crop and fruit pests and infectious and contagious plant diseases known or suspected to be present within the State

or liable to be introduced, and may at any subsequent meeting extend or amend said list. The commission shall also publish methods for exterminating such pests or infectious diseases as they may deem capable of being exterminated within the boundaries of the State, and for suppressing such as can not be exterminated and for preventing the spread of such pests or diseases within the State; and for the purpose of disseminating knowledge concerning contagious diseases or injurious pests affecting crops, plants, trees, etc., and the remedies, preventives, and disinfectants applicable thereto, the commission shall from time to time, as they may deem necessary, have printed and distributed bulletins containing such information, remedies, preventives, and disinfectants as they may approve, including also the rules, orders, ordinances, and regulations of said commission, which said bulletins shall be printed and distributed to all interested persons under the direction and supervision of the Louisiana State board of agriculture and immigration. When the said commission has reason to suspect that any pest or plant disease listed by them as dangerous, exists in any parish of the State, they shall cause such suspicion to be verified by a person competent to determine the specific identity of such crop pests or disease of plant, and if such suspicion prove well founded, the inspector of said commission shall immediately take charge of said infected property and adopt such measures for the treatment or extermination of same as the commission may direct. Any duly authorized agent of the commission shall have authority to inspect any building, warehouse, depot, or place where any property is located, or premises or field supposed to be infested by any crop pest or disease listed and published as such by the said commission, and if, in the opinion of the entomologist selected by said commission, it shall be necessary to destroy the property so infested so as to prevent the further spread of said injurious crop pest or disease, he shall have authority to destroy said property, and the commission shall have the right to fix a compensation to be awarded the owner thereof. If the owner should be dissatisfied with the amount allowed by said commission as compensation for the property destroyed, he shall have the right to appeal to the court of the parish in which such property is destroyed, but in no case shall any contest as to the value of the property to be destroyed suspend action by the commission in enforcing their rules, orders, ordinances, and regulations. Any one who shall seek to prevent any inspection under the direction of said commission, or who shall otherwise interfere with the agents or employes of said commission while in the performance of their duties, shall, upon conviction, be fined not less than twenty-five dollars nor more than five hundred dollars for each offense, or may be imprisoned for not less than ten nor more than thirty days. Prosecution under the provisions of this section shall be instituted in any parish of the State in which the offense is committed.

SEC. 7. *Be it further enacted, etc.,* That all fines collected from prosecutions under the provisions of this act shall be paid to the State treasurer and by him placed to the credit of said commission.

SEC. 8. *Be it further enacted, etc.,* That said commission shall not be required to give any bond or security in any legal proceedings which it shall institute or defend in any court of justice in this State.

SEC. 9. *Be it further enacted, etc.,* That for the purpose of carrying out the provisions of this act the sum of \$25,000, or so much thereof as may be necessary, is hereby appropriated, out of any funds in the treasury not otherwise appropriated, and shall be paid by the State treasurer upon properly authenticated vouchers signed by the president or secretary of said commission.

SEC. 10. *Be it further enacted, etc.,* That all laws or parts of laws in conflict or inconsistent with this act be, and the same are hereby, repealed.

Approved December 15, 1903.

RULES AND REGULATIONS OF THE STATE CROP PEST COMMISSION OF LOUISIANA.

SECTION 1. *Be it declared, ordained, and ordered*, That the following insects are hereby declared to be dangerous crop and fruit pests:

(a) The Mexican boll weevil (*Anthonomus grandis*).

(b) The San Jose scale (*Aspidiotus perniciosus*): *Provided, however*, That this commission may, from time to time, declare other crop and fruit pests and diseases to be dangerous.

SEC. 2. *Be it further ordained and ordered*, That in order to prevent the introduction of the Mexican boll weevil into the uninfested part of the State of Louisiana from the State of Texas and from the infested portion of Louisiana, where the boll weevil is now known to exist, a quarantine is hereby declared to exist against the State of Texas and against the following parishes of Louisiana, to wit: Bossier, Caddo, Calcasieu, Cameron, De Soto, Grant, Natchitoches, Rapides, Red River, Sabine, Vernon, Winn.

(a) That no cotton seed, seed cotton, cotton-seed hulls (except such cotton-seed hulls as are packed, shipped, and handled in a manner approved by this commission when formal permit for their shipment has been issued by this commission, such permit to accompany shipment when consigned to any point in the noninfested portion of Louisiana), or cotton-seed sacks or seed-cotton sacks shall be shipped into the uninfested portion of Louisiana from the State of Texas or from the infested parishes of Louisiana as above enumerated.

(b) That the quarantine hereby declared may, from time to time as the necessity may arise, be extended to include counties in any State or Territory or parishes in the State of Louisiana, or elsewhere.

All railroads, steamboats, express companies, and other common carriers entering the State of Louisiana from the State of Texas or from the infested parishes of this State are especially enjoined to comply with the requirements of this order and of the laws of the State of Louisiana governing same.

SEC. 3. *Be it further declared, ordained, and ordered*, That no person, firm, or corporation, except a duly authorized State or Federal entomologist, shall bring into or have in his possession in the uninfested portion of the State of Louisiana, for any purpose whatever, any living Mexican boll weevil or cotton boll, square, plant, or seed containing the Mexican boll weevil, whether adult or in the pupal, larval, or egg state; and any such person, firm, or corporation violating this provision of the act of the legislature shall, on conviction, as prescribed by section 4 of Act No. 6 of the extra session of the legislature, approved December 15, 1903, be fined not less than twenty-five dollars nor more than one thousand dollars for each offense, or imprisoned for not less than ten days nor more than six months.

SEC. 4. *Be it further declared, ordained, and ordered*, That the experiment-station entomologist shall be the entomologist of this commission; and it is hereby made his duty, with the assistance of the inspectors hereafter provided for, to carry out and enforce the provisions of Act No. 6 of the extra session of the legislature of the State of Louisiana, approved December 15, 1903. In the enforcement of the said act of the legislature he shall have the right, and it is hereby made his duty whenever the public exigencies require it, to prevent the bringing into or carrying through the State of Louisiana of any of the property, articles, or things hereby quarantined against, and to condemn and cause the same to be destroyed, as well as condemn and cause to be destroyed all other property, premises, or fields in this State infested with the Mexican boll weevil or other seriously injurious insect or disease.

The district attorneys throughout the State are hereby especially enjoined to

aid and assist this commission in carrying out the provisions of Act No. 6 of the extra session of the legislature of this State, approved December 15, 1903, as is made their duty by section 5 of said act.

SEC. 5. *Be it further declared, ordained, and ordered,* That, in addition to the entomologist of this commission, the executive committee of this commission may, and is hereby, given power and authority to appoint necessary assistant entomologists, who shall perform such duties as may be assigned to them by the entomologist of this commission, and who shall be under his supervision and control, and shall be subject to removal or dismissal by the executive committee of this commission whenever, in its opinion, it may deem advisable to dispense with their services; such assistant entomologists shall receive and be paid such a salary as may be fixed by the executive committee, payable by the State treasurer on the voucher of the secretary of this commission, approved by the governor, out of any funds to the credit of the commission.

SEC. 6. *Be it further declared, ordained, and ordered,* That as many inspectors as may be necessary be appointed by the executive committee of this commission; such inspectors shall perform their duties under the direct supervision and control of the entomologist of this commission. Each inspector shall receive such a salary for his services as the executive committee may fix, payable monthly by the State treasurer out of any funds to the credit of said commission, on the voucher of the secretary of the commission, approved by the governor. Inspectors shall be liable to removal or dismissal by the entomologist of this commission whenever, in his opinion, it may be advisable to dismiss or remove them. It is hereby made their duty to prevent the bringing into or through the State of Louisiana any of the articles, property, or things hereby quarantined against, and to prevent the shipment or removal, from any infested place in this State to any place in this State not infested, of any of the articles, property, or things which it is hereby declared shall not be removed; and, acting under the authority and control of the entomologist of this commission, and whenever deemed necessary by him, to destroy any and all such property, as well as any and all growing crops, fields, premises, and other property which may be infested with the Mexican boll weevil or other seriously injurious insect or disease. It is hereby further made their duty to cause the arrest of any and all persons guilty of violating any of the rules, orders, and regulations of this commission, as well as any of the provisions of Act No. 6 of the extra session of the legislature of the State of Louisiana, approved December 15, 1903.

SEC. 7. *Be it further declared, ordained, and ordered,* That compensation, when paid for property destroyed, shall be fixed by this commission in the manner provided by section 6 of act No. 6 of the acts of the legislature of this State, approved December 15, 1903.

SEC. 8 (as amended November 7, 1905). (a) No firm, person, or corporation shall sell, ship, exchange, deliver or give away, within the State of Louisiana, any trees, vines, shrubs, buds, cuttings, or plants, or parts of plants, known to be infested with the San Jose scale.

(b) All nursery stock shipped into this State from any other State or country shall be prominently labeled with a certificate of inspection signed by the State entomologist or other duly authorized official of the State or country in which said stock was grown. Shipments not so labeled shall be liable to confiscation upon the order of the entomologist of the crop pest commission.

(c) Transportation companies and their agents shall immediately notify the secretary of the crop pest commission (Shreveport, Louisiana), when by oversight, negligence, or otherwise, any shipment of nursery stock without a proper certificate attached, shall arrive at any station or wharf in this State, and it

shall be the duty of the secretary to proceed as speedily as possible, by himself or his assistant, to investigate and dispose of such shipment.

(d) The entomologist and his assistants shall have authority to inspect any shipment of nursery stock at any station or wharf in this State, and shall have authority to stop any nursery stock when in transit, for the purpose of inspecting the same, regardless of whether such stock shall bear a certificate of inspection or not. The entomologist shall have authority to seize, condemn, and destroy any nursery stock infested with San Jose scale, or other seriously injurious insect or disease, found within the confines of this State.

(e) Each and every person, firm, or corporation growing nursery stock for sale in this State shall apply to the secretary of the crop pest commission for inspection on or before July 1 of each year. It shall be the duty of the secretary to inspect such nursery not later than November 1st. If upon such inspection the nursery stock and premises be found apparently free from the San Jose scale, and other seriously injurious insects and plant diseases, a certificate shall be given to that effect. On and after August 1, 1905, a copy of said certificate bearing the seal of the crop pest commission and the *fac-simile* signature of the secretary, shall be attached to each and every box, bundle, and package of nursery stock shipped within this State. Shipments of nursery stock not so labeled shall be refused for shipment by all common carriers and their agents, and such stock, if found in transit or in the possession of any common carrier by the entomologist or his assistants, shall be liable to confiscation.

(f) No firm, person, or corporation shall sell, give away, exchange, or deliver within this State any trees, vines, shrubs, or plants, commonly known as nursery stock, without same having attached thereto in a prominent manner, a copy of the certificate of inspection signed by the secretary of the State crop pest commission, or by the State entomologist, or other duly authorized official of the State or country in which said nursery stock was grown.

(g) The entomologist of the commission shall have power to require any one in the State to fumigate his trees, shrubs, or plants with hydrocyanic acid gas or other substance, when, in his judgment, such treatment is necessary or advisable for the proper protection of the agricultural or horticultural interests of the State or of any section thereof.

SEC. 9. *Be it further declared, ordained, and ordered.* That these rules and orders be, and the same are hereby, ordered to become operative and to take effect at once; and all previous rules and regulations, or parts thereof, in conflict herewith are hereby repealed. The rules and regulations of the crop pest commission shall be published at such times and in such manner as the commission may deem necessary and expedient.

Adopted October 23, 1905.

MAINE.

SECTION 1. All nurseries or places where trees, shrubs, vines, and plants are grown or offered for sale shall be inspected at least once a year by a competent entomologist to be employed by the commissioner of agriculture; and if no dangerous insects or diseases are found a certificate to that effect shall be issued by the said commissioner of agriculture; said certificate shall contain also the name of the entomologist and the date when said examination is made.

The entomologist employed for this purpose shall report in writing immediately the results of his examination.

Any proprietor or owner of nurseries or places where trees, shrubs, vines, and plants are found to be infected with dangerous insects or diseases shall be noti-

fied of the same by the commissioner of agriculture at once; such proprietor, owner, or his agents are hereby prohibited selling or offering for sale such trees, shrubs, or plants unless the same have been fumigated or otherwise treated under the direction of the commissioner of agriculture, and such trees, shrubs, or plants shall bear a certificate of the same. Any violation of this requirement shall be fined not more than fifty dollars for each and every offense.

SEC. 2. All nursery stock shipped into this State from any other State, country, or province shall bear on each box or package a certificate that the contents of said box or package have been investigated by a duly authorized inspecting officer, and that said contents appear to be free from all dangerous insects or diseases. In case nursery stock is brought into the State without such a certificate the consignee shall return it to the consignor at the expense of the latter: *Provided, however,* That any box or package bearing a certificate of fumigation, which shall be an affidavit made before a justice of the peace, that all stock sold by the consignor has been fumigated in a manner approved by the State nursery inspector of the State from which said nursery stock is shipped, the same may be accepted as though bearing a proper certificate of inspection.

SEC. 3. Any transportation company that shall bring into this State any nursery stock, such as trees, shrubs, vines, cuttings, or buds, and any transportation company, owner or owners of nursery stock, or persons selling nursery stock as thus defined, who shall transport such stock or cause it to be transported within the State, the same not having attached to each box or package an unexpired official certificate of inspection or an affidavit of fumigation which shall meet the requirements specified in section one of this act, shall be guilty of a misdemeanor, and on conviction thereof be subject to a fine not exceeding one hundred dollars for each offense.

SEC. 4. It shall be the duty of the commissioner of agriculture to make full investigation of any locality when the presence of the brown-tail or gypsy moths or other injurious insects or plant diseases may be suspected. Should any person in the State suspect the presence of the brown-tail, the gypsy moth, the San Jose scale, or other injurious insects or diseases preying upon trees, shrubs, or vines in his possession or within his knowledge, he shall forthwith notify the commissioner of agriculture to that effect; and it shall be the duty of said commissioner of agriculture to cause the said trees, shrubs, or vines to be inspected by a competent entomologist, who shall forthwith make a report of the results of his inspection. It shall be the duty of the commissioner of agriculture to disseminate information concerning the brown-tail moth, the gypsy moth, and other injurious insects or plant diseases. Wherever such insects or diseases may be found it shall also be the duty of said commissioner to at once proceed to exterminate or control all such insects and plant diseases as may come to his knowledge within the limits of the means at his disposal.

SEC. 5. For the purpose of inspecting any trees, shrubs, or plants supposed to be infected with dangerous insects or diseases, the authorized entomologist shall have the right to enter private or public grounds, and for the purpose of exterminating or controlling any dangerous insects or diseases that may be found infecting trees, shrubs, or plants the commissioner of agriculture and his employees and municipal officers and their employees shall have the right to enter private and public grounds.

SEC. 6. For the purpose of carrying into effect the provisions of this act the sums of five thousand dollars for the year nineteen hundred and five and for the year nineteen hundred and six, or such part thereof as may be necessary, are hereby appropriated.

SEC. 7. In case of violation of this act it shall be the duty of the commissioner

of agriculture to enforce the penalties set down in sections one and three of this act.

SEC. 8. The statute law entitled "An act for the protection of trees and shrubs from injurious insects and diseases" is hereby repealed.

SEC. 9. This act shall take effect when approved.

Approved February 28, 1905.

MARYLAND.

LAWS OF MARYLAND, 1898, CHAPTER 289.

AN ACT to repeal sections 51, 52, 53, 54, 55, 56, 57, and 58 of Article XLVIII of the Code of Public General Laws, title "Inspection," subtitle "Trees and nursery stock," as designated by chapter 290 of the Acts of the General Assembly of Maryland of 1896, and to reenact the same with amendments, under a new subtitle, to be known as "State horticultural department," and to add thereto eight new sections, to be designated 59, 59A, 60, 61, 62, 63, 64, and 65, providing for the protection of the horticultural interests of the State by the suppression and extermination of the San Jose scale, peach-yellows, pear-blight, and other injurious insect pests and plant diseases, and to create the offices of "State entomologist," "State pathologist," and "State horticulturist," and to appropriate a sum of money therefor.

SECTION 1. *Be it enacted by the general assembly of Maryland,* That sections 51, 52, 53, 54, 55, 56, 57, and 58 of Article XLVIII of the Code of Public General Laws, title "Inspection," subtitle "Trees and nursery stock," as passed by the general assembly of Maryland, session 1896, chapter 290, be, and the same are hereby, repealed and reenacted to read as follows:

51. That a State horticultural department be established for the State of Maryland; that its purpose is to suppress and eradicate the San Jose scale, peach-yellows, pear-blight, and other injuriously dangerous insect pests and plant diseases throughout the State of Maryland.

52. That the professor of entomology, the professor of vegetable pathology, and the professor of horticulture of the Maryland Agricultural College and Experiment Station shall be the State entomologist, State pathologist, and State horticulturist, respectively.

53. That the said horticultural department shall be under the control of the board of trustees of the Maryland Agricultural College and Experiment Station, to whom the officers created under this act shall be responsible; that the salary of the State entomologist and State pathologist shall be fixed by the said board of trustees, and the said board shall likewise fix the compensation of any assistant or assistants, employé or employés, and control all expenses thereof. That the expenses of said department shall be paid out of an appropriation hereinafter provided for, and that said board of trustees be invested with all powers necessary to carry into effect the provisions of this act; but no expenses shall be incurred beyond the amount appropriated.

54. That it shall be the duty of said State entomologist and State pathologist, their assistants, and employés, under the control of trustees of said college, to seek out and suppress all pernicious insect pests and contagious diseases hereinbefore mentioned as destructive to horticultural and agricultural interests of this State, and conduct experiments when necessary to accomplish that end.

55. That in order to accomplish the purposes of this act the State entomologist and the State pathologist, their assistants, and employés, or any other officer, assistant, or employé appointed by said board of trustees are hereby authorized to enter upon any public premises, parks, cemeteries, or other premises, or upon any land of any firm, corporation, or private individual within the

State of Maryland for the purpose of inspection, destroying, treating, or experimenting upon the insects and diseases aforesaid. Should any insect or disease found by said State entomologist or State pathologist, or by any other officer appointed by said trustees, be, in their opinion, capable of eradication without the destruction of the tree or plant, then said officers are to treat or cause to be treated with proper remedies and appliances all such trees, vines, shrubs, plants, and grains. Further, said State officers shall treat or have treated, in order to prevent the dissemination of the aforesaid insects or diseases, any and all suspicious trees, vines, shrubs, plants, and grains found to be in a dangerous proximity to those infested as aforesaid.

56. That should any of the officers aforesaid, through their assistants and employes, or by any notification whatsoever, find any fruit trees, vines, shrubs, plants, or grains infested or diseased with the aforesaid insects or diseases, the aforesaid officers shall mark or tag in some conspicuous way all trees, vines, shrubs, plants, or grains infested with the aforesaid diseases and shall give notice in writing to the owner or owners, tenants, or person in charge of such premises of the condition thereof, and thereupon, if such person or persons so notified shall not within ten (10) days after notification, destroy or treat the same in accordance with regulations and rules of said trustees, a copy of which will be sent on application to any person, then said trustees shall, through their officers, assistants, or employes, destroy or treat all such trees, plants, vines, shrubs, and grains, and the State officers shall file a statement of the expenses of such destruction or treatment with the trustees of said college, and said trustees shall transmit a copy of such statement and account of such expenditure, with the usual affidavit attached thereto to be made by the State officers, which shall be sufficient evidence to prove the claim to the State's attorney of the county where the owner of such premises resides, and said attorney is directed to collect the same and account to the trustees of the Maryland Agricultural College therefor.

57. That it shall be the duty of said trustees to send the State entomologist, or the State pathologist, or their duly authorized assistants, at least once a year into each county of the State for the purpose of determining by inspection the healthfulness and general condition of the horticultural and agricultural interests.

58. That it is hereby also made the duty of the said board of trustees, through the State entomologist and the State pathologist, or their duly authorized assistants, to inspect at least once in every six (6) months all nurseries of trees, vines, shrubs, and plants subject to the aforesaid insects or diseases within the State, and if found free, so far as can be determined by inspection, from the aforesaid insects or diseases, to give to the owner or owners, or persons in charge of said nurseries, a certificate of inspection showing such nurseries or premises to be apparently free from such insects and diseases. If any of the aforesaid insects or diseases should be found in any nursery or orchard, or any premises within the State where nursery stock is grown, the aforesaid officers shall cause to be destroyed or treated such portion of such nursery stock or other trees or plants as in their opinion may be necessary, and shall release all other nursery stock grown upon said premises and issue a certificate of inspection to the owner or owners as herein provided for; and if such infested or diseased trees, vines, plants, or shrubs be destroyed by the aforesaid officers, then the owner shall pay the cost thereof, and if he refuse to pay the same it shall be collected as prescribed in section 56. No nurseryman, broker, agent, dealer, or other person shall be permitted to sell, ship, send out, or give away, by mail, express, freight, or otherwise, any trees, vines, shrubs,

plants, buds, or cuttings from any such nurseries or premises without accompanying the same with a copy of the said certificate printed upon a tag or label not easily destroyed, the same to be firmly attached in some conspicuous position upon each carload, box, bale, or package so sent out or delivered.

SEC. 2. *And be it enacted by the general assembly of Maryland.* That the following sections be, and the same are hereby, added to Article XLVIII of the Code of Public General Laws, title "Inspections," subtitle "Horticultural department," to be designated as sections 59, 59 A, 60, 61, 62, 63, 64, and 65.

59. That should any nurseryman, agent, broker, dealer, or other person send out or deliver within the State, or transport to any other State or Territory, or the District of Columbia, trees, vines, shrubs, plants, buds, or cuttings subject to the attacks of insects and diseases above provided for without attaching a copy of said certificate, deface or destroy said certificate, or wrongfully attach a certificate, he shall be adjudged guilty of a misdemeanor, and shall upon conviction before any justice of the peace be fined a sum not less than ten dollars (\$10.00) or more than one hundred dollars (\$100.00) and costs of prosecution for each and every offense, and stand committed until such fine and costs are paid, and the fines so collected shall be paid to the trustees of the said college, and be added to the funds herein provided for carrying out the provisions of this act.

59 A. That all trees, plants, vines, shrubs, buds, or cuttings, commonly known as nursery stock, grown or handled by each and every nurseryman within this State, and subject to the attacks of the aforesaid insects or disease, shall be fumigated by the nurseryman owning the same with hydrocyanic-acid gas in buildings or enclosures inspected and approved by the aforesaid State officers under their discretion.

60. That when any trees, plants, shrubs, vines, buds, or cuttings, commonly known as nursery stock, are shipped into the State from any other State or Territory or the District of Columbia to any nurseryman, broker, dealer, agent, or other person in this State, every carload, bale, box, or package thereof shall be plainly labeled on the outside with the name of the consignor, the name of the consignee, and a certificate showing that the contents have been inspected by a qualified State or Government officer, and that the trees, plants, vines, shrubs, or cuttings therein contained are apparently free from the insects and diseases herein provided for. Whenever any trees, plants, vines, shrubs, buds, or cuttings are shipped into this State from any other State or Territory or the District of Columbia without such certificate plainly fixed on the outside of each carload, box, bale, or package, the agent of the transportation company, firm, or person receiving same shall not deliver said nursery stock to the consignee or agent representing the consignor, and said agent of the transportation company, firm, or person shall notify the State entomologist or State pathologist at the Maryland Agricultural College, and said State officer receiving such notification shall immediately notify any justice of the peace of this State to issue a summons for the consignee and the agent or consignor, if he be known, of such carload, bale, box, or package of nursery stock to appear before him on a certain day to be named therein to show why such trees, plants, vines, shrubs, buds, or cuttings should not be seized as being in violation of the provisions of this act, and on trial thereof, if said justice be satisfied that the provisions of this act have been violated, said justice shall order said agent or consignee to return such carload, box, bale, or package of trees, plants, shrubs, vines, buds, or cuttings immediately to the shipper or consignor, unless said consignee or agent of the consignor at his expense shall forthwith have said nursery stock examined by the State entomologist and State pathologist of this State and such

officers certify to such justice of the peace that said nursery stock is apparently free from the insects and diseases mentioned herein, and tag every such carload, box, bale, and package inspected by said officers with their certificate of inspection; and if said agent or consignee shall fail to have said nursery stock examined by said State officials or fail to return such carload, box, bale, or package thereof, then said justice of the peace shall order and direct the constable or sheriff to burn and destroy all such trees, plants, shrubs, vines, buds, or cuttings that have been shipped into this State in violation of this act.

61. That whenever any agent of a transportation company, firm, or person shall receive a carload, box, bale, or package of trees, plants, shrubs, vines, buds, or cuttings without a certificate attached, as provided for in section 60 of this act, and shall fail to notify the State entomologist or State pathologist of this fact immediately upon the arrival of such nursery stock, and before delivering the same to the consignee, said agent of the transportation company, firm, or person shall be adjudged guilty of a misdemeanor, and shall, upon conviction before a justice of the peace, be fined a sum not less than ten dollars (\$10.00) nor more than one hundred dollars (\$100.00) and costs of prosecution for each and every offense, and stand committed until such fine and costs are paid; and the fines so collected shall be paid to the trustees of said college to be added to the funds herein provided for carrying out the provisions of this act. If any nurseryman, dealer, or agent sell, ship, or deliver any trees, plants, shrubs, or vines into or in this State, which is infested with San Jose scale, peach-yellows, pear-blight, or other injurious diseases, and upon examination by the State pathologist, State entomologist, or their assistants, is condemned by being so infested, the said trees, plants, vines, and shrubs shall be destroyed, and the nurseryman, dealer, or agent shall forfeit the value of such stock, and shall not collect the same from the purchaser or consignee.

62. That the State entomologist, State pathologist, and State horticulturist shall submit annually a written report on or before the first day of February of their inspections and investigations to the board of trustees, which shall be transmitted to the governor of the State and the general assembly, and published, as are the reports of other State organizations, and distributed among the people of the State as bulletins of the Maryland agricultural experiment station.

63. That the report of the present State entomologist, including the work done by him up to the date of the passage of this act, shall be published and distributed as indicated and provided for in section 62 of this act, as the first annual report of the Maryland state entomologist.

64. That the sum of ten thousand dollars the first year, and eight thousand dollars annually thereafter be, and is hereby, appropriated in order to carry out the provisions of this act and properly provide for the above-described inspections; to employ men qualified for their respective positions; to procure the requisite facilities and equipment necessary for the proper performance of the duties herein incurred, and to offer means of support for investigation in addition to the inspection work of the State officers, and the dissemination of information that will promote the horticultural and agricultural interests of this State.

65. That the comptroller be, and that he is hereby, authorized to issue his warrant upon the treasurer of this State for the said sum of ten thousand dollars for the year eighteen hundred and ninety-eight, and the sum of eight thousand dollars annually thereafter, out of any funds not otherwise appropriated; that the said sum of money shall be payable to the Maryland Agricultural College on or before the first of October of each fiscal year, and the first yearly payment

shall be made during the fiscal year ending September first, eighteen hundred and ninety-eight.

SEC. 3. *And be it enacted*, That this act shall take effect from the date of its passage.

Approved April 9, 1898.

MASSACHUSETTS.

ACTS OF 1902, CHAPTER 495.

AN ACT to authorize the State board of agriculture to appoint a State nursery inspector and to provide for the protection of trees and shrubs from injurious insects and diseases.

Be it enacted, etc., as follows:

SECTION 1. The State board of agriculture shall annually appoint some person qualified by scientific training and practical experience, to be State nursery inspector, and he shall be responsible to the board for the performance of his duties as prescribed in this act. The said inspector may appoint such number of deputies, not exceeding three, as he may deem necessary or expedient.

SEC. 2. It shall be the duty of the State nursery inspector, either personally or through his deputies, to inspect at least once each year all nurseries or places in the State where nursery stock is grown, sold, or offered for sale, and if no dangerous insect or fungous pests are found therein a certificate to that effect shall be given. If such pests are found therein the owner of the stock shall take such measures to suppress the same as the State nursery inspector shall prescribe, and no certificate shall be given until the said inspector has satisfied himself by subsequent inspections that all such pests have been suppressed.

SEC. 3. Any owners of nurseries or of places in the State where nursery stock is grown, sold, or offered for sale, who do not hold an unexpired certificate of inspection after the first annual inspection made after the passage of this act, who shall sell or otherwise dispose of nursery stock in the State, shall be subject to a penalty of not less than twenty-five nor more than one hundred dollars for each offence.

SEC. 4. Any owners of nurseries or of places in the State where nursery stock is grown, sold, or offered for sale, who shall fumigate with hydrocyanic-acid gas all stock which they sell, using at least two-tenths of a gram of potassic cyanide to every cubic foot of space contained in the box, house, or other place wherein this fumigation is performed, which place shall be gas tight, and who shall expose the said stock to the fumes of this gas of the strength aforesaid for at least forty minutes, or who shall treat the stock which they sell by some other method approved by the State nursery inspector, and who shall make affidavit before a justice of the peace that all stock sold by them has thus been fumigated or treated, and who shall attach a copy of such affidavit to each package, box, or car of stock sold, shall be exempt from the provisions of sections two and three of this act.

SEC. 5. All nursery stock shipped into this State from any other State, country, or province shall bear on each box or package a certificate that the contents of said box or package have been inspected by a duly authorized inspecting officer, and that said contents appear to be free from all dangerous insects or diseases. In case nursery stock is brought within the State without such a certificate the consignee shall return it to the consignor at the expense of the

latter, or shall call the State nursery inspector to inspect the same: *Provided, however,* That any package or box bearing a certificate of fumigation which meets the requirements specified in section four of this act may be accepted as though bearing a proper certificate of inspection.

SEC. 6. The State nursery inspector shall determine the season for inspecting nurseries and the forms of certificates to be given, but in no case shall he issue a certificate which shall continue in force after the first day of July next following the date of inspection. He or any of his deputies shall at all times have the right to enter any public or private grounds in the performance of any duty required by this act. He and each of his deputies shall receive five dollars for each day's service required of them under this act, and the travelling and other expenses necessarily incurred in the said service.

SEC. 7. A sum not exceeding one thousand dollars may be expended by the State board of agriculture in carrying out the provisions of this act.

Approved June 19, 1902.

CHAPTER 381.

AN ACT to provide for suppressing the gypsy and brown-tail moths.

Be it enacted, etc., as follows:

SECTION 1. For the purposes of this act the pupæ, nests, eggs, and caterpillars of the gypsy and brown-tail moths and said moths are hereby declared public nuisances, and their suppression is authorized and required; but no owner or occupant of an estate infested by such nuisance shall by reason thereof be liable to an action, civil or criminal, except to the extent and in the manner and form herein set forth.

SEC. 2. The governor, by and with the consent of the council, shall appoint a superintendent for suppressing the gypsy and brown-tail moths and shall determine his salary. The governor may, with the consent of the council, remove said superintendent at any time for such cause as he shall deem sufficient. In case of the death, removal, or resignation of the superintendent the governor shall forthwith appoint a successor. On or before the third Wednesday in January in each year the superintendent shall make a report of his proceedings to the general court, which shall be a public document and shall be printed. Said report shall separate so far as is practicable the expenditures on work against the gypsy moth from those on work against the brown-tail moth in each city and town.

SEC. 3. The said superintendent shall act for the Commonwealth in suppressing said moths as public nuisances, in accordance with the provisions of this act. For this purpose he shall establish an office and keep a record of his doings and of his receipts and expenditures, and may make rules and regulations. He may employ such clerks, assistants, and agents, including expert advisers and inspectors, as he may deem necessary and as shall be approved by the governor. He may make contracts on behalf of the Commonwealth; may act in cooperation with any person, persons, corporation, or corporations, including other States, the United States, or foreign governments; may conduct investigations and accumulate and distribute information concerning said moths; may devise, use, and require all other lawful means of suppressing or preventing said moths; may lease real estate when he deems it necessary, and, with the approval of the board in charge, may use any real or personal property of the Commonwealth; may at all times enter upon the land of the Commonwealth or of a municipality, corporation, or other owner or owners, and may use all reasonable means in carrying out the purposes of this act; and, in the undertakings aforesaid, may,

in accordance with the provisions of this act, expend the funds appropriated or donated therefor; but no expenditure shall be made or liability incurred in excess of such appropriations and donations.

SEC. 4. Cities and towns, by such public officer or board as they shall designate or appoint, shall, under the advice and general direction of said superintendent, destroy the eggs, pupæ, and nests of the gypsy and brown-tail moths within their limits, except in parks and other property under the control of the Commonwealth, and except in private property, save as otherwise provided herein. When any city or town shall have expended within its limits city or town funds to an amount in excess of five thousand dollars in any one calendar year in suppressing gypsy or brown-tail moths the Commonwealth shall reimburse such city or town to the extent of fifty per cent of such excess above said five thousand dollars.

Cities or towns where one twenty-fifth of one per cent of the assessed valuation of real and personal property is less than five thousand dollars and where the assessed valuation of real and personal property is greater than six million dollars shall be reimbursed by the Commonwealth to the extent of eighty per cent of the amount expended by such cities or towns of city or town funds in suppressing the gypsy and brown-tail moths in any one calendar year in excess of said one twenty-fifth of one per cent.

In the case of towns where the assessed valuation of real and personal property is less than six million dollars, after they have expended in any one calendar year town funds to an amount equal to one twenty-fifth of one per cent of their assessed valuation of real and personal property, the Commonwealth shall expend within the limits of such towns, for the purpose of suppressing the gypsy and brown-tail moths, such an amount in addition as the superintendent, with the advice and consent of the governor, shall recommend. Disbursements made by said last-named towns in excess of said one twenty-fifth of one per cent shall be reimbursed by the Commonwealth every sixty days; but in the case of all others the Commonwealth shall reimburse cities and towns annually according to the provisions of this act.

No city or town shall be entitled to any reimbursement from the Commonwealth until it has submitted to the auditor of the Commonwealth itemized accounts and vouchers, showing the definite amount expended by it for the purpose of this act; nor shall any money be paid out of the treasury of the Commonwealth to cities or towns, pursuant to the provisions of this act, until said vouchers and accounts have been approved by the auditor of the Commonwealth.

For the purposes of this section the years nineteen hundred and five and nineteen hundred and seven shall be considered half years, and the valuation for the year nineteen hundred and four shall be taken as a basis.

SEC. 5. When, in the opinion of the superintendent, any city or town is not expending a sufficient amount for the abatement of said nuisance, then the superintendent shall, with the advice and consent of the governor, order such city or town to expend such an amount as the superintendent shall deem necessary: *Provided*, That no city or town where the assessed valuation of real and personal property exceeds six million dollars shall be required to expend during any one full year more than one-fifteenth of one per cent of such valuation, and that no town where the assessed valuation of real and personal property is less than six million dollars shall be required to expend during any one full year more than one twenty-fifth of one per cent of such valuation. For the purposes of this section the valuation of the year nineteen hundred and four shall be used.

Any city or town failing to comply with the directions of the said superintendent in the performance of said work within the date specified by him shall pay a fine of one hundred dollars a day for failure so to do, said fine to be collected by information brought by the attorney-general in the supreme judicial court for Suffolk County.

SEC. 6. The mayor of every city and the selectmen of every town shall, on or before the first day of November in each year, and at such other times as he or they shall see fit, or as the State superintendent may order, cause a notice to be sent to the owner or owners, so far as can be ascertained, of every parcel of land therein which is infested with said moths, or, if such notification appears to be impracticable, then by posting such notice on said parcels of land, requiring that the eggs, pupæ, and nests of said moths shall be destroyed within a time specified in the notice.

When, in the opinion of the mayor or selectmen, the cost of destroying such eggs, pupæ, and nests on lands contiguous and held under one ownership in a city or town, shall exceed one-half of one per cent of the assessed value of said lands, then a part of said premises on which said eggs, pupæ, or nests shall be destroyed may be designated in such notice, and such requirement shall not apply to the remainder of said premises. The mayor or selectmen may designate the manner in which such work shall be done, but all work done under this section shall be subject to the approval of the State superintendent.

If the owner or owners shall fail to destroy such eggs, pupæ, or nests in accordance with the requirements of the said notice, then the city or town, acting by the public officer or board of such city or town designated or appointed as aforesaid, shall, subject to the approval of the said superintendent, destroy the same, and the amount actually expended thereon, not exceeding one-half of one per cent of the assessed valuation of said lands, as heretofore specified in this section, shall be assessed upon the said lands; and such an amount in addition as shall be required shall be apportioned between the city or town and the Commonwealth in accordance with the provisions of section four of this act. The amounts to be assessed upon private estates as herein provided shall be assessed and collected, and shall be a lien on said estates in the same manner and with the same effect as is provided in the case of assessments for street watering.

SEC. 7. If, in the opinion of the assessors of a city or town, any land therein has received, by reason of the abatement of said nuisances thereon by said superintendent or by said city or town, a special benefit beyond the general advantage to all land in the city or town, then the said assessors shall determine the value of such specific benefit and shall assess the amount thereof upon said land: *Provided*, That no such assessment on lands contiguous and held under one ownership shall exceed one-half of one per cent of the assessed valuation of said lands: *And provided*, That the owner or owners shall have deducted from such assessment the amount paid and expended by them during the twelve months last preceding the date of such assessment toward abating the said nuisances on said lands, if, in the opinion of the assessors, such amount has been expended in good faith. Such assessment shall be a lien upon the land for three years from the first day of January next after the assessment has been made, and shall be collected under a warrant of the assessors to the collector of taxes of such city or town, in the manner and upon the terms and conditions and in the exercise of the powers and duties, so far as they may be applicable, prescribed by chapter thirteen of the Revised Laws relative to the collection of taxes.

Real estate sold hereunder may be redeemed within the time, in the manner, and under the provisions of law, so far as they may be applicable, set forth in chapter thirteen of the Revised Laws for the redemption of land sold for taxes.

A person aggrieved by such assessment may appeal to the superior court for the county in which the land lies, by entering a complaint in said court within thirty days after he has had actual notice of the assessment, which complaint shall be determined as other causes by the court without a jury. The complaint shall be heard at the first sitting of said court for trials without a jury after its entry; but the court may allow further time, or may advance the case for speedy trial, or may appoint an auditor as in other cases. The court may revise the assessment, may allow the recovery back of an amount wrongfully assessed which has been paid, may set aside, in a suit begun within three years from the date thereof, a collector's sale made under an erroneous assessment, may award costs to either party and may render such judgment as justice and equity require.

If, in the opinion of the assessors, the owner of an estate upon which an assessment as aforesaid has been made is, by reason of age, infirmity, or poverty, unable to pay the assessment, they may upon application abate the same. Every city or town in rendering an account to the State auditor as provided for in section four of this act shall deduct from such amount as it has expended in excess of one twenty-fifth of one per cent or of five thousand dollars as provided in said section, the total amount it has received for work performed under section six of this act during the term covered by the account: *Provided*, Such work was performed under such conditions as require reimbursement in whole or in part by the State.

SEC. 8. To meet the expenses incurred under authority of this act there shall be allowed and paid out of the treasury of the Commonwealth, during the period up to and including May first, nineteen hundred and seven, the sum of three hundred thousand dollars. Of this amount seventy-five thousand dollars may be expended during the calendar year nineteen hundred and five; one hundred and fifty thousand dollars, and any unexpended balance of the previous year, may be expended during the calendar year nineteen hundred and six; and seventy-five thousand dollars, and any unexpended balance of the previous years, may be expended during the calendar year nineteen hundred and seven, up to and including May first.

SEC. 9. An additional sum of ten thousand dollars in each of the years nineteen hundred and five, nineteen hundred and six, and nineteen hundred and seven may, in the discretion of the State superintendent, be expended by him for experimenting with parasites or natural enemies for destroying said moths, and any unexpended balance of any year may be expended in the subsequent years.

SEC. 10. Chapter two hundred and ten of the acts of the year eighteen hundred and ninety-one and sections one and two of chapter five hundred and forty-four of the acts of the year eighteen hundred and ninety-eight and section two of chapter fifty-seven of the acts of the year nineteen hundred and two are hereby repealed.

SEC. 11. A person who wilfully resists or obstructs the superintendent or an official of a city or town, or a servant or agent duly employed, while lawfully engaged in the execution of the purposes of this act, shall forfeit a sum not exceeding twenty-five dollars for each offence.

SEC. 12. Valuations of real and personal property of the year nineteen hundred and four shall govern the provisions of this act.

SEC. 13. This act shall take effect upon its passage.

Approved May 8, 1905.

MICHIGAN.

ACT 91, P. A. 1905.

AN ACT to prevent the importation from other States and the spread within this State of dangerous insects and dangerously contagious diseases affecting trees, shrubs, vines, plants, and fruits, and to repeal all acts or part [parts] of acts that contravene the provisions of this act.

The people of the State of Michigan enact:

SECTION 1. It shall be unlawful for any person or persons, firm or corporation, knowingly, to keep upon their premises, or upon premises under their control or charge, any trees or fruit infected with the diseases known as peach yellows, rosette, or little peach, or any part of a tree infected with the diseases known as black knot or pear blight, or any tree, shrub, plant, or vine infected with any other dangerously contagious disease, or infested with the San Jose scale, cankerworm, or any other dangerously noxious insect pest. It shall also be unlawful for any person or persons, firm or corporation, knowingly, to sell or offer for sale, or to give away, any tree, shrub, plant, or vine infected or infested with any dangerously infectious disease or noxious insect, or any fruit infected with peach yellows.

SEC. 2. The State board of agriculture shall, upon the passage of this act, appoint some competent person to be known as State inspector of orchards and nurseries, who shall hold office for two years, and whose duties shall be as hereinafter prescribed. He shall have power to appoint such number of deputy inspectors as may be necessary, subject to the approval of the State board of agriculture. Said deputy inspectors shall act under the orders of, and shall perform such duties as may be directed by the State inspector of orchards and nurseries. The salary, or per diem, of the State and deputy inspectors shall be fixed by the State board of agriculture.

SEC. 3. Any person or persons, firm or corporation, growing or offering for sale, in this State, any trees, shrubs, vines, or plants, commonly known as nursery stock, shall, on or before the first day of August in each year, apply to the Michigan State board of agriculture for the inspection of said stock under the provisions of this act and for a license for its sale. A license fee of five dollars shall be paid, and a bond for one thousand dollars, with sureties satisfactory to said board, and conditioned upon the compliance with the requirements of this act, shall be filed. No nursery stock shall be shipped or delivered until it has been examined by the State inspector of orchards and nurseries, or a deputy inspector and has received a certificate as hereinafter provided. All growers or dealers in nursery stock shall, upon demand, file with the State board of agriculture a list of the persons to whom they have sold or delivered any nursery stock, giving the species, which list shall be for the sole use of the State inspector of orchards and nurseries and his deputies: *Provided*, That the provisions of this section shall not apply to persons engaged in fruit growing, who are not nurserymen, but desire to sell or exchange surplus fruit plants of their own growing: *Provided further*, That the provisions of this section shall not apply to farmers or other persons who may sell shade trees from their own wood lots.

SEC. 4. No person or persons, firm, or corporation, residents of another State, Territory, province, or country, shall engage or continue in the business of selling or taking orders within this State for the sale of any trees, plants, shrubs, or vines, commonly known as nursery stock, without first obtaining from the State board of agriculture a license, as provided for in section three of this act, and

filing a certificate of inspection from a State or Government officer, or some person designated by the Michigan State board of agriculture.

SEC. 5. The State board of agriculture shall, upon the receipt of the required fee and a satisfactory bond and certificate of inspection, issue a license to each applicant, whether a resident of this State or of another State, province, or country, permitting the sale of nursery stock by the holder, or by his accredited agents, for the period ending the thirty-first of July following the date upon which said license goes into effect.

SEC. 6. It shall be the duty of the State inspector of orchards and nurseries to examine all nurseries in the State, at least once each year, for the presence of San Jose scale and other dangerously injurious insects and diseases. If found to be apparently free from such dangerous insects and diseases, a certificate to that effect shall be given the owner, upon the payment of an inspection fee sufficient to defray the per diem of the inspector. Said certificate shall be void on the thirty-first day of July following. In case any dangerous insect or infectious disease is found upon any nursery stock the inspector shall order and enforce such treatment as may be deemed sufficient to exterminate such insects or diseases before granting a certificate. If a subsequent examination shall show the stock to be infected, or infested, the certificate may be revoked.

SEC. 7. Whenever a nurseryman or other person shall ship or deliver within this State, except for scientific purposes, any trees, shrubs, plants, or vines, commonly known as nursery stock, he shall place upon each car, box, bale, or other package a copy of a certificate of inspection, the original of which is signed by said inspector. Failure to do this, or the illegal use of said certificate by changing, defacing, or placing it upon uninspected stock, or using the same after it has expired or been revoked, shall render the shipper or owner liable to the penalties prescribed for a violation of this act. Dealers in nursery stock purchased from other firms may, upon filing with the State inspector of orchards and nurseries duplicate copies of the certificates of inspection issued upon the stock grown by said firms, and on the payment of a fee of one dollar, receive a certificate showing that the stock has been inspected. Said certificate may be used for the shipment of nursery stock that has come to them accompanied by a certificate of inspection, but for no other. Nurserymen may ship under their own certificate of inspection any stock that has come to them later than the first day of the previous August accompanied by a certificate of inspection, and, if from another State, Territory, province, or county, by a certificate of fumigation as required by this act.

SEC. 8. If any nursery stock of species subject to the attack of the San Jose scale has been grown within one-half mile of where the San Jose scale exists, or has been known to exist within two years, it shall, before it is shipped or delivered, be fumigated with hydrocyanic-acid gas of the strength commonly used for such purpose for not less than thirty minutes. All trees, plants, shrubs, and vines of species subject to the attack of the San Jose scale shipped into this State from another State, Territory, province, or country, must be fumigated with hydrocyanic-acid gas in the usual manner, and each car, box, or bale in which said nursery stock is shipped shall have upon it a certificate signed by the shipper stating that such fumigation has been given in addition to the usual certificate of inspection.

SEC. 9. The owner of any nursery trees, vines, shrubs, or plants, upon receiving notice from the State inspector of orchards and nurseries that any or all of them are infected or infested with dangerous insects or diseases, shall, within the time specified in such notice, take such steps as will fully comply with the orders of the State inspector of orchards and nurseries, and he shall not ship or

deliver any such trees, vines, shrubs, or plants until after they have received such treatment and until they have been reexamined and a certificate of inspection has been granted.

SEC. 10. Whenever it shall happen that the State inspector of orchards and nurseries shall give the notice heretofore required to the owner of nursery stock for the destruction of the insects or diseases mentioned, and said owner shall fail or neglect to take the measures necessary for the destruction thereof within the time mentioned in the notice given him, the State inspector of orchards and nurseries shall enter complaint against said owner and may seize and take possession of said infected or infested nursery stock. Such seizure may be made without a warrant. Said infected or infested nursery stock shall be disposed of in such manner as may be directed by the court before whom the offense is tried, or by any court of competent jurisdiction.

SEC. 11. Whenever any trees, shrubs, plants, or vines, commonly known as nursery stock, are shipped into this State from another State, Territory, province, or country, every package thereof shall be plainly labeled on the outside with the names of the consignor and consignee, and the character of the contents, and certificates shall be attached to each package showing that the contents have been inspected by a State and Government officer and that they have been fumigated in the usual manner with hydrocyanic-acid gas. If any trees, shrubs, vines, or plants, commonly known as nursery stock, are shipped into this State without such certificates being plainly fixed on the outside of the package, box, or car containing the same, the fact must be reported within twenty-four hours to the Michigan State board of agriculture, or its regularly appointed inspector, by the railway, express, or steamboat company or the person or persons carrying the same; and any agent of a railway, express, or steamboat company or any other person or persons who shall fail to comply with the provisions of this section shall be deemed guilty of a misdemeanor. The State inspector of orchards and nurseries shall have authority, when he has reason to believe that nursery stock that has been shipped into the State, or shipped by some nursery in the State, is infested or infected with dangerous insects and diseases, to examine the same, and, if found to be infected by any dangerously contagious disease or infested with dangerous insects, such stock may be seized without a warrant as a public nuisance. The shipper shall be notified of the seizure, and orders shall be given him to either destroy the stock or to give it effectual treatment. If this is not done within five days, complaint shall be made to some court having competent jurisdiction, and said infected or infested stock shall be disposed of in such manner as may be directed by said court.

SEC. 12. It shall be the duty of the State inspector of orchards and nurseries, whenever it shall come to his knowledge that San Jose scale, cankerworm, peach yellows, rosette, little peach, black knot, or pear blight, or any other noxious insects or dangerously infectious diseases exist, or are supposed to exist, in any orchard, or upon any trees, shrubs, vines, plants, or fruits in this State, to investigate the case and if such dangerous insects or diseases are found he shall notify the owner, or his agent, in writing. The notice shall consist of a simple statement of the facts as found to exist, with an order to uproot and destroy in such manner as may be indicated all trees infected with yellows, little peach, or rosette, or to cut off and burn the portions infected with black knot and pear blight, or if attacked by San Jose scale or cankerworm, to effectually spray the trees, or to use such remedies as may be prescribed for other dangerous insects and diseases within five days, or such time from the date of the service of the notice as may be designated: *Provided also*, That no

such spraying shall be done while said fruit trees or vines are in blossom, except in case of cankerworm. In the case of fruit infected with yellows the notice shall require its immediate destruction. Failure to comply with the requirements of said notice shall render the owner or agent liable to the penalties prescribed for the violation of this act.

SEC. 13. In any township, village, or city in this State in which the insects known as the San Jose scale, and cankerworm, or the diseases known as peach yellows, rosette, little peach, black knot, and pear blight, or any other destructive insects or dangerously infectious diseases exist, or in which there is good reason to believe they exist, or danger may be apprehended of their introduction, it shall be the duty of the township board, or the village or city council, as soon as such information becomes known to such board or council, or any member thereof to appoint three competent freeholders of said township, village, or city, to be known as fruit and orchard inspectors, who shall hold office during the pleasure of said board or council: *Provided*, That inspectors already appointed, and in office under similar and previous acts, shall continue in said office under this act until the expiration of the term for which they were appointed.

SEC. 14. It shall be the duty of said inspectors, within ten days after appointment, as aforesaid, to file their acceptance of the same with the clerk of said township, village, or city, and said clerk shall be ex officio clerk of said board of fruit and orchard inspectors, and he shall keep a record of the proceedings of said board in a book to be provided for the purpose, and shall file and preserve all papers pertaining to the duties and actions of said inspectors, or either of them, which shall be a part of the records of said township, village, or city.

SEC. 15. It shall be the duty of the township, village, or city inspectors, or any one of them, whenever it comes to their notice that any of the dangerously injurious insects or diseases mentioned in section thirteen of this act exist, or are supposed to exist, within the limits of their township, village, or city, to proceed without delay to examine the trees, shrubs, vines, plants, or fruits supposed to be infested or infected, and if destructive insects or a dangerously infectious disease is found to exist, a distinguishing mark shall be placed upon the trees, shrubs, vines, or plants, and a written notice shall be served upon the owner or his agent. This notice shall be as provided for in section twelve of this act. In case the owner refuses to accept the opinion of a single inspector regarding the nature of an insect or disease, or the remedy that shall be employed, he may within two days appeal to the other inspectors in the township, village, or city by serving a written notice of such appeal upon each of them. Upon receipt of such notice of appeal, it shall be the duty of each and every inspector, if he has not already done so, to examine the trees, shrubs, plants, or vines supposed to be infested or infected, and if all or a majority of said inspectors agree that a dangerous insect or disease is present, they shall serve notice upon the owner or his agent as above. If the decision of the full board of inspectors is still unsatisfactory to the person in charge, he may, within twenty-four hours, make an appeal to the State inspector of orchards and nurseries, who shall at once investigate the matter and order the proper treatment, and his opinion and orders shall be final. If the members of a township, village, or city board of fruit and tree inspectors are unable to agree, or are in doubt, regarding the nature of an insect or disease, or the treatment that should be given, they may call upon the State inspector of orchards and nurseries for information and advice. In cases where an owner appeals to the full board of township, village, or city inspectors, or to the State inspector, and the findings of the original inspector are approved, the expense incurred as the result of the appeal shall be paid by the owner, and, in

case of his refusal to do so, the amount shall be certified to the township board, or village or city council, which shall allow the same and assess it as a special tax upon the property.

SEC. 16. In case the owner, or the person in charge of trees, shrubs, vines, or plants infested with a destructive insect or a dangerously contagious disease refuses or neglects to carry out the orders of the State inspector or of the township, village, and city inspectors, within the period stated in the notice served upon him, the State, township, village, or city inspectors, respectively, shall employ such aid as may be necessary to carry out their orders and recommendations. In case the owner refuses to reimburse them for the expense incurred, it shall be certified to the township board, or village or city council, who shall allow it and spread it as a special tax upon the property concerned.

SEC. 17. The State inspector of orchards and nurseries and his deputies, assistants, and employes shall have authority to enter upon any premises in the State for the purpose of examining the trees, shrubs, plants, and vines for the presence of destructive insects and diseases, and, if any such insects or diseases are found, may, under the provisions of this act, take such steps as may be necessary to exterminate them. Township, village, and city inspectors shall have the same authority within the limits of their respective jurisdiction. No damage shall be awarded for the destruction of any tree, shrub, plant, or fruit, or for injury to the same, if done by the inspectors and their assistants in accordance with the provisions of this act: *Provided*, It is deemed necessary in order to suppress dangerous insects and diseases.

SEC. 18. The township, village, and city fruit and tree inspectors shall be allowed for services under this act two dollars for each full day and one dollar for each half day, and their per diem and other charges and disbursements hereunder shall be audited by the township board, or village or city council.

SEC. 19. Persons, firms, or corporations engaged in growing or selling plants commonly grown in greenhouses shall not be required to take out a license: *Provided*, They do not grow or handle nursery stock, and certificates of inspection are not required under this act for the shipment of greenhouse plants.

SEC. 20. Any person or persons, firm, or corporation who may fail to comply with any of the provisions of this act shall be deemed guilty of a misdemeanor and shall be punished by a fine of not less than ten dollars and not exceeding one hundred dollars, or by imprisonment in the county jail for not less than ten nor more than ninety days, or both such fine and imprisonment, in the discretion of the court, and jurisdiction is hereby conferred in these cases upon any justice of the peace, or other competent court, of the township, village, or city where such trees, shrubs, or plants may be, or where such nursery stock or fruit is grown, sold, shipped, disposed of, or delivered, contrary to the provisions of this act. In all cases where a complaint is made under the provisions of any section of this act by any State, township, village, or city inspector said complainant shall not be required to furnish security for costs.

SEC. 21. The State inspector of orchards and nurseries shall have authority to employ such aid and obtain such apparatus and supplies as may be needed for the proper performance of his duties, and the bills for the same and for the per diem and traveling and other necessary expenses of the State inspector, his deputies and assistants, shall be audited by the State board of agriculture, and the auditor-general shall draw his warrant for the payment of the same from the general fund of the State: *Provided*, That all moneys collected by the State board of agriculture under this act shall be paid into the State treasury.

[Sec. 22 repeals acts 108 and 109, of 1895; act 137, of 1897.]

MINNESOTA.

AN ACT to prevent the introduction and spread of injurious insects and dangerous plant diseases in the State of Minnesota.

Be it enacted by the legislature of the State of Minnesota:

SECTION 1. The entomologist of the State experiment station is hereby constituted the State entomologist and charged with the execution of this act. He may appoint such qualified assistants as may be necessary, fix a reasonable compensation for their labor, and pay the same, and their acts shall have the same validity as his own. He shall, by himself or his assistants, between the first day of May and the fifteenth day of September in each year, when requested by the owner or agent, or when he has reasonable ground to believe that any injurious insect pests or dangerous and contagious plant disease exist, carefully examine any nursery, fruit farm, or other place where trees or plants are grown for sale, and if found apparently free from any injurious insect pests or dangerous or contagious plant diseases, he shall issue his certificate stating the facts (good for one year unless revoked), and shall collect therefor a fee of five dollars (\$5.00) per day and expenses.

SEC. 2. The State entomologist shall have authority, when requested by the owner or agent or when he has reasonable grounds to believe any injurious insect pests or dangerous and contagious plant diseases exist, to enter upon any of the grounds mentioned in section 1 hereof, public or private, for the purpose of inspection, and, if he finds any nursery, orchard, garden, or other place infested by any injurious insect pests or dangerous and contagious plant diseases, he may, by himself or his assistants, enter upon such premises and establish quarantine regulations.

If, in his judgment, any insect pests or dangerous and contagious plant diseases may be eradicated by treatment, he may, in writing, order such treatment and prescribe its kind and character. In case any trees, shrubs, or plants are found so infested that it would be impracticable to treat them he may order them burned. A failure for 10 days after the delivery of such order to the owner or persons in charge to treat or destroy such infected trees or plants as ordered, shall authorize the entomologist to perform this work by himself or his assistants and to ascertain the cost thereof. He shall certify the amount of such cost to the owner or person in charge of the premises, and if the same is not paid to him within 60 days thereafter he shall certify the amount thereof to the county attorney, whose duty it shall be to proceed forthwith to collect the same of him in a civil suit and return the amount so recovered over to the State auditor to reimburse the State for the money expended.

SEC. 3. When nursery stock is shipped into the State accompanied by a certificate of inspection by a State entomologist from the State from which the shipment has been made, stating that the stock has been inspected and found to be free from any injurious insect pests or dangerous and contagious plant diseases, it shall be held prima facie evidence of the facts therein stated, but the State entomologist, by himself or his assistants, when he or they have reason to believe that any such stock is nevertheless infested by any injurious insect pests or dangerous or contagious plant diseases shall be authorized to inspect the same and submit it to like treatment as that provided for in section 2 hereof, and if, by reason of the failure for 48 hours of the owners of such stock to comply with the treatment prescribed or to destroy the stock, if so ordered, the State entomologist or his assistants are required to perform the work themselves, and it shall be the duty of the entomologist to certify the amount of the cost thereof to the owner or the person in charge of such stock so treated or

destroyed, and if the same is not paid to him within 10 days thereafter he shall certify the amount thereof to the county attorney of the county in which the stock may be found in an affidavit and it shall be the duty of the county attorney to file said affidavit with the village, city, or town clerk of the village, city, or town in which such stock may be, and the same shall thereupon constitute a lien thereon, which it shall be the duty of the county attorney to proceed to collect forthwith in a civil suit and to turn over the amount recovered by him in such suit to the State auditor to reimburse the State for the money expended.

SEC. 4. It shall be unlawful for any person, firm, or corporation to bring into the State any trees, plants, vines, cuttings, and buds, commonly known as nursery stock, unless accompanied by a certificate of inspection by a State entomologist of the State from which the shipment is made, showing that the stock has been inspected and found apparently free from any injurious insect pests, or dangerous and contagious plant diseases.

SEC. 5. Any person violating or neglecting to carry out the provisions of this act, or offering any hindrance to the carrying out of this act, shall be adjudged guilty of a misdemeanor; and, upon conviction before a justice of the peace, shall be fined not less than \$10 nor more than \$100 for each and every offense, together with all the costs of the prosecution, and shall stand committed until the same are paid.

SEC. 6. All fees or other amounts collected or received by any person under the provisions hereof shall be by him forthwith turned into the State treasury to be paid over to the State auditor to be added to the fund provided for combating injurious insects in Minnesota, and all expenses incurred in enforcing the provisions hereof shall be paid out of said fund.

SEC. 7. This act shall take effect and be in force from and after June 1, 1903.

AN ACT to prevent the destruction of grasses, grains, and other crops by grasshoppers.

Be it enacted by the legislature of the State of Minnesota:

SECTION 1. Every tract or parcel of land in this State so infested in any year with the eggs of grasshoppers as to be so eminently dangerous to grasses, grains, or other crops growing, or to grow, in or upon lands situate in the vicinity of the tract or parcel so infested as to threaten the destruction of a great part of any of such grasses, grains, or other crops, shall from and after the date when it becomes the duty of the owner or lessee thereof to plow the same as provided in this act, and so long as the same remains unplowed and so infested, be deemed a public nuisance.

SEC. 2. The board of county commissioners in any county in this State is hereby authorized at any regular or special session thereof to hear and consider complaints relative to any tract or parcel of land claimed to be infested with the eggs of grasshoppers and to fully investigate the facts in any such case. The certificate of the State entomologist to the effect that he had made examination of any such infested tract or parcel, or any portion thereof described by him, and that in his opinion such tract or parcel, or any portion thereof so described, is or is not so infested with the eggs of grasshoppers as to be greatly dangerous to grasses, grains, or other crops growing, or to grow, on lands situate in the vicinity of the tract or parcel so infested as to threaten the destruction of a great part of any thereof, shall be prima facie evidence of the facts therein stated at any such hearing of said board, or in any civil action authorized by, or arising from anything done pursuant to, this act. The person complaining shall cause notice to be served upon the owner of such tract, or his lessee, at

least 10 days prior to the day of such hearing, describing therein the tract complained of, the nature of the complaint, and the session of the board when application will be made for such hearing, naming the first day of such session, whereupon the hearing may be had on said day, or upon such future day as the board shall then appoint therefor. Such notice may be served in the manner as provided in section 3 of this act for the service of a copy of the order therein authorized.

SEC. 3. If the board of county commissioners shall, after the hearing and investigation authorized by the preceding section, be of the opinion that any tract or parcel of land, or any portion thereof, is so infested with the eggs of grasshoppers to the extent contemplated by section one (1) of this act, it shall make and file its order to that effect, directing therein that the owner or lessee of such tract or parcel plow the same within the time therein stated, and cause a copy of such order to be served upon such owner, or his agent or lessee, within such time as the board shall direct, not less than 20 days from the date of said order. Such copy shall be served upon such owner or lessee, if he be a resident of the county, in the same manner that a summons is served in a civil action; and, if such owner or lessee resides in another county, service thereof may be made upon the agent of such owner or lessee, if any, residing in the county; and if the owner is not a resident of this State, or his residence is unknown, and he has no known agent or lessee in the county, then service may be made by publication for two consecutive weeks in a legal newspaper printed at the county seat of such county, the last of which publications shall be made not less than 10 days prior to the date when the plowing of any such tract or parcel is required to be commenced.

The order of the said board authorized by this section may be in substantially the following form:

Whereas, At a meeting of the board of county commissioners of _____ county, held on the _____ day of _____, 19 __, the said board did duly hear and investigate relative to a complaint that the tracts or parcels of land hereinafter described are so infested with the eggs of grasshoppers as to be greatly dangerous to grasses, grains, or other crops growing, or to grow, on the lands situate in the vicinity of such tracts, as to threaten the destruction of a great part of such grasses, grains, or other crops; and

Whereas, The said board is of the opinion that such danger exists, the said tracts being described as follows:

(Here insert description.)

It is hereby ordered and described that the owner (or his lessee) of said tract or parcel of land shall, not later than the _____ day of _____, 190 __, begin, and with reasonable dispatch continue, the plowing of said tract or parcel, and all thereof, and complete such plowing prior to the _____ day of _____, 190 __.

(Or, if all the lands complained of are not so infested, then describe the portions thereof found to be so infested and required to be plowed.)

The county auditor is hereby required to cause a copy of this order to be served upon the owner of the lands hereby required to be plowed, or his **agent** (or lessee), in the manner required by law for the service thereof.

Chairman Board of County Commissioners.

County.

Attest:

_____, County Auditor.

Dated _____.

SEC. 4. If the owner, or his lessee, of any tract or parcel of land described in any order made pursuant to section 3 of this act, upon whom service of a copy of such order has been duly made, shall fail or neglect to substantially comply therewith, he shall be deemed to maintain a public nuisance within the meaning of this act, and to consent that the said tract or parcel of land may be plowed by the county, and the board of county commissioners, when informed of such failure or neglect, shall cause the land found by it to be so infected to be plowed, under the direction of the chairman of said board, and the expenses incurred by reason of such plowing shall be paid out of the county treasury, upon the warrant of the county auditor, in favor of the person entitled to the same.

SEC. 5. Whenever any tract of land shall have been plowed by the county, pursuant to the provisions of this act, and the plowing thereof shall be of value to the owner, or his lessee thereof, in the raising of any crops thereon during the season immediately following such plowing, such owner or lessee shall be liable to the county to the value of such plowing. Whenever the board of county commissioners is of the opinion that any such liability has arisen by reason of such plowing, it shall determine the sum for which the owner or lessee is so liable, and direct the county auditor to demand the immediate payment thereof into the county treasury; and, if the same is not paid upon such demand, it is hereby made the duty of the county attorney to bring a civil action in the name of such board against the party so in default for the recovery of the same, and interest thereon from the date of such demand, provided that the amount so determined by the board of county commissioners shall be prima facie evidence of the value of such plowing.

SEC. 6. For the purposes of this act, the entomologist employed by the regents of the University of Minnesota, at the State experiment station, located at the capital of the State, shall be deemed the State entomologist.

SEC. 7. This act shall take effect and be in force from and after its passage.

MISSISSIPPI.

AN ACT to make an appropriation for the years 1904 and 1905, for the purpose of preventing the introduction into the State of Mississippi of the Mexican cotton boll weevil, and to provide for the destruction and eradication of the same, whenever and wherever found in the State; establishing rules and regulations in relation thereto, and providing for the enforcement of the same.

SECTION 1. *Be it enacted by the legislature of the State of Mississippi,* That the entomologist of the Mississippi agricultural experiment station is empowered, and it shall be his duty to prevent in every possible and practicable way the introduction into this State of the Mexican boll weevil, its eggs, larvæ, or any other form of life through which it passes in development, should it make its appearance in this State, whenever and wherever found in this State.

SEC. 2. The entomologist of the Mississippi agricultural experiment station shall have power to adopt rules and regulations governing the inspection, sale, and transportation of trees, plants, hays, cotton, cotton seed, cotton-seed hulls, or any other material or products of whatever nature or kind from districts or States known or suspected to be infested with the Mexican cotton boll weevil, and may require such articles and material to be disinfected or fumigated, according to his directions, or destroyed if found to be infected and their destruction is deemed necessary, and it shall be unlawful for any person or persons, or any transportation company, to bring or cause to be brought into this State any article or articles that may serve to introduce the Mexican cotton boll weevil, contrary to the rules and regulations of the entomologist, and it shall also be unlawful for any person or persons residing without the State to send into the

State by mail, express, or otherwise, any living specimens of the Mexican cotton boll weevil, in any of its forms of development or egg state, and any person or persons violating any of the provisions of this section shall be guilty of a misdemeanor, and upon conviction thereof shall be fined in a sum not less than fifty dollars nor more than five hundred dollars.

Sec. 3. That any person or persons coming into this State from any district or State known to be infected by the Mexican cotton boll weevil, who shall be suspected of having on or about his person, clothes, household effects, or other property in his possession said Mexican cotton boll weevil in any of its forms, knowingly or unknowingly concealed or otherwise, shall be refused admittance into the State until he shall have undergone an examination of his person or property, or both, at the hands of the said entomologist or his authorized agents, and the said entomologist shall have power to make and enforce quarantine regulations against animals, and all persons suspected or found to be in possession of clothes or other property infected by said Mexican cotton boll weevil.

Sec. 4. The entomologist of the Mississippi agricultural experiment station shall have power to appoint one or more deputies and assistants in each county or district, who shall have power to carry out and enforce such regulations and execute such plans as shall be made and adopted by the said entomologist, and it shall be the duty of the sheriff of each county of the State to cooperate with the said entomologist, and to execute in a summary way the orders and regulations of the said entomologist, or his agents and assistants, in relation to the prevention of the introduction and eradication of the Mexican cotton boll weevil, in the seizure of persons, animals, or property suspected of being infected with said boll weevil.

Sec. 5. For the purpose of carrying out the provisions above set out that the sum of ten thousand dollars, or so much thereof as may be necessary, for the years 1904 and 1905, be appropriated, out of any moneys in the State treasury not otherwise appropriated, to be paid out by the treasurer of the State, on warrants drawn by the said entomologist, approved and countersigned by the governor, and each warrant shall specify the purpose for which it is drawn and the object for which the money is to be expended. The entomologist shall have full and plenary power and authority to make, promulgate, and enforce such rules, ordinances, and regulations, and to do and perform such acts as in his judgment may be necessary to control, eradicate, and prevent the introduction, spread, or dissemination of the Mexican cotton boll weevil in the State.

Sec. 6. It shall be the duty of the entomologist of the Mississippi agricultural experiment station to make a full and complete and itemized report of all his doings and expenditures, under the provisions of this act, to the legislature of this State, at the session of 1903, published in pamphlet form. The entomologist shall have power to inspect growing or field crops supposed to be infested with the boll weevil, and shall have authority to destroy said property and shall have a right to fix compensation.

Approved March 18, 1904.

MISSOURI.

SESSION ACTS OF 1901. PAGE 134.

AN Act to prevent the introduction and dissemination in Missouri of dangerous insect pests and fungoid and other contagious or infectious diseases dangerously injurious to fruit trees, vines, bushes, or nursery stock, with an emergency clause.

Be it enacted by the general assembly of the State of Missouri as follows:

SECTION 1. Whenever any trees, vines, bushes, scions, buds, cuttings, or any nursery stock are shipped into this State from another State, country, or

province, every package or quantity thereof shall be plainly labeled on the outside with the name and address of the consignor, the name and address of the consignee, the contents, and a certificate showing that the contents have been inspected by a State or experiment station entomologist of the State from which the shipment was made; that the trees, vines, bushes, scions, cuttings, buds, or other nursery stock therein contained are free from the San Jose scale, peach yellows, rosette, or other dangerously injurious insects or contagious or infectious fungoid or other diseases, and whenever any trees, vines, bushes, scions, cuttings, buds, or other nursery stock are shipped into the State without such certificate plainly fixed on the outside of the package, box, or car containing the same, the fact must be reported to the consignor by the railway company, steamboat company, or express company, or other person or persons, corporations, or companies carrying the same, and said package, box, or car, or quantity thereof shall not be delivered to the consignee until the same bear the aforesaid certificate, and any railway company, steamboat company, or express company, person or persons, or corporation, or company who shall violate or evade the provisions of this section, or offer any hindrance to the carrying out of this act, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined any sum not less than one hundred dollars nor more than five hundred dollars, and such fines shall accrue to the benefit of the general revenue fund of the State of Missouri.

SEC. 2. There being no adequate provision for the above control of the injurious insects and diseases of the agricultural and horticultural interests of the State, creates an emergency within the meaning of the constitution; therefore, this act shall take effect and be in force from and after its passage.

Approved March 12, 1901.

ARTICLE III, CHAPTER 67, REVISED STATUTES OF 1899.

SEC. 4725. *Station established.* There is hereby created and established a fruit experiment station in south Missouri. (New section.)

SEC. 4726. *Purposes of experiment station.* The leading objects of said experiment station shall be to experiment with the different kinds of fruits, to wit, apples, peaches, berries of all kinds, grapes and small fruits of all kinds, and to ascertain the varieties that are the best adapted to this State; and to study the different diseases and insects to which said fruits, berries, and grapes are subject and the remedies to prevent diseases and insects from injuring or infecting said trees and orchards, with power to destroy and remove any infected trees or orchards if necessary in the judgment of the manager and inspector of said experiment station, to keep the disease or insects or plague from scattering and infecting other trees or orchards, under rules hereinafter set out. (New section.)

SEC. 4727. *Board of trustees—Manager and inspector—Appointment—Qualifications.* There is hereby created a board of trustees of the members and a manager and inspector. The manager and inspector shall be scientists and a graduate of some scientific college, and be versed in diseases of fruits, trees, and insects which infect them, and be versed in the different kinds of fruits, grapes, and berries. Said board of trustees shall be appointed by the governor, by and with the advice and consent of the senate; said trustees to hold their office for six years: *Provided*, That the governor shall first appoint three trustees, one for the term of two years, one for the term of four years, and one for

the term of six years; that as the term of office shall expire the successors shall be appointed for six years from the time of expiration of the term of the outgoing member; the manager and inspector shall be appointed for a term of four years by the board of trustees: *Provided*, Either the trustees or manager and inspector, or any of them, may be removed for cause and successors appointed. (New section.)

SEC. 4728. *Manager and inspector.* Said manager and inspector shall be under the control of the board of trustees of the experiment station. (New section.)

SEC. 4729. *Services of manager, how obtained.* It shall be lawful for any five freeholders, residents of this State, to go before any clerk of a court of record and demand the presence and services of said manager in the following manner:

State of Missouri, County of ———, ss:

To the manager of the fruit experiment station of the State of Missouri: We, the undersigned citizens, freeholders of the county of ———, believe that there exists in this locality a dangerous infectious disease among the (here name the fruit trees, grapes, or berries) located on the farm or in the orchard or orchards of the following-named party, to wit: ———, located as follows, to wit: (Here describe the lands as near as possible). Therefore, we request the presence of the manager and inspector of the fruit experiment station.

Which petition may be certified as follows:

I hereby certify that the above-named petitioners are known to me to be reputable citizens of this county.

Clerk of ——— court of ——— County, Mo.

(New section.)

SEC. 4730. *Duty of manager on receipt of petition.* Such petition may be forwarded by mail or otherwise, as said petitioners may elect, to meet the manager and inspector of the fruit experiment station at the place where said station is located, who shall, as early as possible after the receipt of the same, go to the locality named and give such aid and instructions as he may think best for the prevention, cure, or eradication of the disease or insects with which he may find the trees, berries, vines, or orchards infected, and request said petitioners to report to him, in writing, the result of the treatment prescribed. (New section.)

SEC. 4731. *Duties of manager, continued.* Said manager and inspector may also, on information satisfactory to himself, visit any locality in this State without receiving any petition as provided for in the preceding section, where he may think his presence necessary to the protection of orchards, berries, small fruits, vineyards, grapes, and fruit-tree interests in the State, and make a thorough investigation as to the health and condition of said fruit trees, berries, vines, and fruits of all kinds in that locality. (New section.)

SEC. 4732. *Proceedings when trees, etc., are found to be diseased.* If upon investigation said manager and inspector shall be satisfied that said fruit trees, grapevines, berry vines, or the fruit, berries, or grapes are diseased, and that the disease is liable to spread to other trees, vines, or orchards, or that the trees are infected with any kind of insects that are liable to destroy said trees, vines or fruits or make them worthless, and that the same is liable to spread to other trees, vines, orchards, or vineyards, he shall thereupon notify the county court or any other authority having the jurisdiction of the county court, or any two judges thereof in vacation, of the county in which said diseased fruits, trees, vines, or fruits are located, setting forth the number and kind of trees, vines, or

fruits infected and the nature of the disease or insect, with the name of the owner, if known, if he resides in the county; if not, then to the person in charge of the diseased fruit trees, vines, or fruits to appear before said court on a day to be named in the notice. Said notice to be served not less than ten days before the hearing notifying said owner or person in charge to appear before the court and show cause, if any, why said diseased fruit trees or vines should not be dug up and burned, said notice to be served by the sheriff the same as ordinary summons, and notice to the person in charge shall be sufficient notice to the owner: *Provided*, The owner shall not be known, or be outside of the county. (New section.)

SEC. 4733. *Diseased trees, etc., to be destroyed on order of county court, when.* Upon the parties hereinbefore specified being notified and appearing, if it shall appear to the court that said trees or vines are infected with any disease or insect that are likely to spread to other trees, vines, orchards, or vineyards, and that the same can not be eradicated, cured, or the insects killed, then the court shall make an order that the trees or vines so infected be dug up and burned, under the direction and supervision of the manager and inspector of said fruit experiment station, who may employ some person or persons to dig up and burn said trees or vines, for which services the laborers employed shall receive not to exceed \$1.50 per day each for their services, to be paid out of the contingent fund of said fruit experiment station; and it is further provided, that the manager or inspector shall have the right to enter on any premises to investigate and inspect fruit trees, grapevines, or berry vines or the fruits, and also to enter said premises with such persons as he may employ to dig up and burn said trees, and shall not be guilty of trespass or any damages whatever while in the discharge of his duties. (New section.)

SEC. 4734. *Compensation of manager and trustees.* The manager and inspector shall receive a salary of two thousand dollars per annum and necessary traveling expenses, and the trustees shall each receive the sum of three hundred dollars per annum and necessary traveling expenses, all to be paid by the State of Missouri. (New section.)

SEC. 4735. *Commissioners to locate station.* Upon the passage and taking effect of this article the governor shall appoint three commissioners to locate said experiment station, and may receive donations of either land or money for and in consideration of the location of the same at any one point; said commissioners to receive \$5 per day and their traveling expenses for locating said station. (New section.)

MONTANA.

AN ACT to create the Montana State board of horticulture.

Be it enacted by the legislative assembly of the State of Montana:

SECTION 1. There is hereby created a State board of horticulture, to consist of seven members, six of whom shall be appointed by the governor, one from each of the horticultural districts that are hereby created, and the State executive, who shall be an ex officio member of the board. No person shall, however, be appointed on said board, or employed by them, who shall be connected in any way with any nursery, or who shall be engaged in the sale or handling for profit of any nursery product.

SEC. 2. The State shall be divided into the following horticultural districts: The first district shall comprise the counties of Dawson, Custer, Yellowstone, Sweet Grass, Carbon, Park, and Rosebud; the second district shall comprise

the counties of Gallatin, Madison, Jefferson, Beaverhead, Silver Bow, Lewis and Clark, Meagher, and Broadwater; the third district shall comprise the counties of Cascade, Fergus, Valley, Chouteau, and Teton; the fourth district shall comprise the counties of Missoula, Granite, Powell, and Deer Lodge; the fifth district shall comprise the county of Ravalli, and the sixth district shall comprise the county of Flathead.

SEC. 3. The members shall reside in the district for which they are appointed. They shall be selected with reference to their study of and practical experience in horticulture and the industries dependent thereon. They shall hold office for a term of four years, and until their successors are appointed and qualified: *Provided, however,* That two of the board first appointed—to be determined by lot—shall retire at the expiration of two years. All vacancies in the board shall be filled by appointment of the governor, and shall be for the unexpired term.

SEC. 4. The board is authorized to employ a secretary and prescribe his duties, who shall hold his appointment at the pleasure of the board. Before entering upon the discharge of his duties, each member and employe of the board shall take and subscribe to the oath of office, which said oath shall be filed with the secretary of state.

SEC. 5. The board may call together and hold, in conjunction with horticultural societies, public meetings of those interested in horticulture and kindred pursuits, and may publish and distribute such proceedings and discussions as in its judgment may seem proper, provided the sum so expended shall not exceed the sum of \$300 per annum.

The board shall meet on the third Monday of February and September of each year, and as much oftener as it may deem expedient.

SEC. 6. The office of the board shall be located at such place as the majority thereof may determine, and shall be in charge of the secretary during the absence of the board.

SEC. 7. For the purpose of preventing the spread of contagious diseases among fruit and fruit trees, and for the prevention, treatment, cure, and extirpations of fruit pests and diseases of fruit and fruit trees, and for the disinfection of grafts, scions, and orchard debris, empty fruit boxes or packages, or other suspected material or transportable articles dangerous to orchards, fruit, and fruit trees, said board may prescribe regulations for the inspection, disinfection, or destruction thereof, which regulation shall be circulated in printed form by the board among fruit growers and fruit dealers of the State, and shall be published at least ten days in two horticultural papers of general circulation in the State, and shall be posted in three conspicuous places in each county in the State, one of which shall be at the county court-house thereof.

For further prevention of the spread of diseases dangerous to fruit and fruit trees, it shall be unlawful for any person or persons, dealer or dealers, to allow or cause to be used the second time any crate, box, barrel, package, or wrapping once having contained fruit or nursery stock, and that the destruction of the same must be made in its entirety, and that the finding of such crate, box, barrel, package, or wrapping in possession of any person or persons, dealer or dealers, other than the consignee, shall be considered prima facie evidence of a violation of this act.

Any member of the board or officer thereof is hereby authorized to seize and destroy by burning, without breaking such crate, box, barrel, package, or wrapping, wherever found, and to prosecute said violator or violators.

SEC. 8. The said board shall elect from their own number, or appoint from without their number, to hold office at the pleasure of the board, one competent person in each district, to be known and act as inspector of fruit pests. Said

inspectors shall be selected with reference to their study and practical experience in horticulture. It shall be the duty of said inspectors to visit the nurseries, orchards, stores, packing houses, warehouses, and other places where horticultural products and fruits are kept and handled within their respective districts and to see that the regulation of the State board of horticulture to prevent the spread of fruit pests and diseases of trees and plants and the disinfection of fruits, trees, plants, grafts, scions, orchard debris, and empty fruit boxes and other material shall be fully carried out and complied with. Said inspectors shall have free access at all times to all premises where any trees, plants, fruits, or horticultural products or supplies are kept or handled and shall have full power to enforce the rules and regulations of the State horticultural board and to order the destruction and disinfection of any or all trees, plants, fruits, or horticultural products or supplies found to be infected with any disease, as prescribed or designated by said board.

The said board may appoint one or more, as necessary, competent persons, to be known as special inspectors, whose general powers and duties shall be regulated and prescribed by the member of the board for that district. Such special inspector shall receive such sum per day as the said board of horticulture may agree upon, provided such sum shall in no case exceed the sum of five dollars per day for the time actually employed.

The said board shall appoint one person, to be known as inspector at large for the State, whose duties shall be prescribed by the board and who shall receive the sum of five dollars per day for the time actually employed.

SEC. 9. It shall be the duty of every person or persons, corporation or corporations who shall sell or deliver to any person or persons, corporation or corporations any trees, plants, vines, scions, or grafts to notify the secretary of the board, whose duty it shall be to notify the inspector of said district wherein such vines, etc., etc., are to be delivered at least five days before said goods are to be delivered, giving the date and nursery or railroad station where said trees, plants, scions, etc., etc., are to be delivered, together with the name of the party or parties who are to receive the same. It shall be the duty of the inspector receiving said notice to inspect the said trees, plants, grafts, scions, etc., etc., as soon thereafter as practicable, and if the same be found free from any and all diseases or pests, as designated by said State board of horticulture, he shall so certify and shall attach such certificate to each lot or bill of trees, grafts, plants, scions, etc., which said certificate must contain a list of the said trees, grafts, scions, vines, or plants so inspected. But if any of the trees, grafts, scions, vines, or plants so inspected shall be found to be diseased or infested with any of the pests, as prescribed by the said board, then the inspector shall order the disinfection or destruction of said trees, grafts, scions, vines, etc., etc., etc., so diseased or infected, together with all boxes, wrapping, or packing pertaining thereto, and charge and collect the sum of ten dollars (\$10) for the disinfection and inspection of each carload of said nursery stock and a proportionate sum for less than car lots, but in no instance for less than \$2 for each separate inspection or disinfection, provided, that the State board of horticulture shall have power to designate certain places as quarantined stations, where all nursery stock brought into the State shall be inspected and disinfected.

For the inspection of fruits a fee of two cents per box or package, with a maximum fee of five dollars for each separate lot or car, shall be charged and collected. The inspectors shall collect such fees and shall not give certificates of inspection until the fees are paid.

SEC. 10. If any person or persons in charge or control of any nursery, orchard, storeroom, packing house, or other place where horticultural products or sup-

plies are handled or kept shall fail or refuse to comply with the rules and regulations of the said State board of horticulture or shall fail or refuse to disinfect or destroy any diseased or infected trees, plants, scions, vines, grafts, shrubs, or other horticultural supplies or products when ordered so to do by the inspector of such district he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than \$25 nor more than \$300.

SEC. 11. It shall be the duty of every owner or manager of every orchard, nursery, storeroom, packing house, or other place where horticultural products or supplies are kept or handled, which shall become diseased or infected with any injurious insect or pest, to immediately, upon discovery of the existence of such disease or pest, to notify the inspector of said district of the existence of the same. It shall be the duty of such owner or manager at his own proper expense to comply with and carry out all the instructions of said inspector for the eradication of any disease or pest. If he shall fail to do so, he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than \$25 nor more than \$300.

SEC. 12. If any person or persons, corporation or corporations shall fail or refuse to forthwith comply with the instructions of said inspector, for the eradication of any disease or pest, said inspector shall proceed forthwith to eradicate such disease or pest and the expense of the same shall become a charge and a lien upon the property of such owner.

SEC. 13. Every person who, for himself or as agent for any other person or persons, corporation or corporations, transportation company or common carrier, shall deliver or turn over to any person or persons, corporation or corporations, any trees, vines, shrubs, nursery stock, scions, grafts, without first having attached the inspector's certificate, as provided in section 9 of this act, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in a sum not less than \$25 nor more than \$300.

SEC. 14. No person or persons, corporation or corporations, shall be liable to any other person or persons, corporation or corporations, for any damage to any trees, vines, or shrubs, nursery stock, scions, or grafts by reason of the same being held to await the certificate of the inspector, as provided in section 9 of this act.

SEC. 15. The inspectors of fruit pests appointed or elected by said board shall receive as compensation for their services such sum as the board may regulate, provided not to exceed five dollars per day for the time actually employed. The members of said board shall receive no compensation for their services, except actual expenses paid out. The secretary of said board shall receive the sum of \$1,000 per annum for his services.

SEC. 16. All bills for expenditures under this act shall be audited and passed upon by said board of horticulture, and if found legal and just shall be allowed, subject to the approval of the State board of examiners, and a warrant shall be drawn therefor upon the auditor of the State of Montana, who shall draw his warrant upon the State treasurer therefor.

SEC. 17. It shall be the duty of the secretary to attend all meetings of the board and procure records of the proceedings and correspondence, to collect books, pamphlets, periodicals, and other documents containing valuable information relating to horticulture, and to preserve the same; to collect statistics and other information showing the actual condition and progress of horticulture in this State and elsewhere; to correspond with agricultural and horticultural societies, colleges, and schools of agriculture and horticulture, and other persons and bodies as may be directed by the board, and prepare, as required by

the board, reports for publication. He shall also act as assistant to and obey the directions of the inspectors of fruit pests under the direction of the board.

SEC. 18. The board shall biennially, in the month of January, report to the legislature a statement of its doings and abstracts of the reports of the inspectors of fruit pests, and of the secretary.

SEC. 19. There is hereby appropriated for the use of the State board of horticulture as set forth in this act, out of the moneys in the State treasury not otherwise appropriated, the sum of seven thousand dollars, \$3,500, or so much thereof as may be necessary, for the year commencing December 1, 1904, and \$3,500, or so much thereof as may be necessary, for the year commencing December 1, 1905.

SEC. 20. All sums of moneys collected as fines for violations of any of the provisions of this act shall be turned into the State treasury for use in defraying expenses of the board hereby created, and the appropriations hereby made shall be paid out of the fund to the extent of the money therein contained.

SEC. 21. Every person who for himself, or as agent for any other person or persons, transportation company, or common carrier, shall deliver or turn over to any person or persons, corporation or corporations, any fruits without first having attached the inspector's certificate, shall be deemed guilty of a misdemeanor.

SEC. 22. No person, firm, or corporation shall engage or continue in the business of selling within the State or importing fruit trees, plants, or nursery stock into the State, without first having obtained a license to do business in this State, as in this act provided.

SEC. 23. Any person, firm, or corporation may obtain a license to engage in the business of selling fruit trees, plants, or nursery stock into this State upon the payment of the sum of twenty-five dollars and by filing with the secretary of the State board of horticulture bond with sureties in the sum of one thousand dollars (\$1,000), conditioned that the principals will faithfully obey the laws of the State of Montana and that the said principals will pay the cost of fumigation of all nursery stock or other materials or goods imported into or sold within the State by the said principal or his or their agent and the expense of destruction of any infected nursery stock. License granted under this act shall be for one year, provided, however, that such license may be revoked at any time for any violation of this act at the discretion of the board.

SEC. 24. It shall be the duty of every person, firm, or corporation licensed to do business under this act to notify the secretary of the State board of horticulture of his intention to ship an invoice of fruit trees, plants, or nursery stock from one point to another in this State, or from any point without this State into this State. The said notice shall contain the name and address both of the consignor and consignee, and the invoice of the goods to be shipped, the freight or express office at which the goods are to be delivered, and the name or title of the transportation company from whom the consignee is to receive such goods.

Such notice shall be mailed at least five days before the day of shipment.

SEC. 25. It shall be the duty of each person or corporation offering to sell, or selling and delivering, any nursery stock, fruit trees, plants, vines, scions, cuttings, etc., etc., within the State of Montana, to place on each and every package so sold and delivered a label or card, containing the name and address of both the consignor and consignee and the invoice of the stock therein contained.

SEC. 26. Any person or persons who shall receive and accept any nursery stock, fruit trees, plants, vines, scions, cuttings, grafts, etc., etc., that have not been inspected by a duly appointed inspector of the State board of horticulture,

and shall use or dispose of said nursery stock, fruit trees, vines, plants, scions, cuttings, grafts, etc., etc., without first notifying the inspector and furnishing him opportunity to examine, and if necessary fumigate the said nursery stock, will be deemed guilty of a misdemeanor and will be subject to fine as further provided in this act.

SEC. 27. All nursery stock, trees, plants, vines, and cuttings grown or growing within the State of Montana used for filling orders shall, after said stock shall have been taken from the nursery rows or grounds, and before the same shall have been packed for delivery, be inspected by a duly appointed inspector and shall be disinfected by fumigating or other method, when in his judgment such is necessary. After such inspection, if it be found that said nursery stock, trees, plants, vines, and cuttings are clean and free from insects and fungi pests, he shall issue his certificate to said nurseryman, and said certificate shall entitle him to use said stock so inspected and disinfected for filling orders for next current delivery.

Nurseries shall give to the secretary of the board five days' notice of the time when said stock shall be ready for inspection under the provision of this act.

SEC. 28. Any person or persons, corporation or corporations, transportation companies or common carriers, violating any of the provisions of this act, shall be deemed guilty of a misdemeanor and fined in the sum of not less than twenty-five dollars (\$25), nor more than three hundred dollars (\$300).

SEC. 29. All acts and parts of acts in conflict herewith are hereby repealed.

SEC. 30. This act shall take effect and be in force from and after its passage and approval.

Approved February 17, 1899.

RULES OF THE MONTANA STATE BOARD OF HORTICULTURE.

RULE 1. It shall be the duty of the inspector after receiving notice of the arrival of any nursery stock, to immediately have the same inspected or fumigated and he shall, if he finds after inspection said nursery stock free from any and all diseases, place his certificate upon each and every package showing that the said nursery stock has been inspected or fumigated, giving name of the inspector, the date of inspection and place; but if the said nursery stock be found to be infected with any of the diseases or insects injurious to orchards as prescribed by the board of horticulture, other than the San Jose scale, woolly aphis, black knot of the plum and black knot of the cherry, the said diseased stock shall be properly treated, but if the said nursery stock shall be infected with San Jose scale, woolly aphis, black knot of plum, black knot of cherry, crown gall, or root knot, then the inspector shall destroy the same by burning, together with all wrapping and packing, and shall issue a certificate to the shipper or owner showing cause for destruction.

RULE 2. All nursery stock, trees, plants, vines, and cuttings of any kind shipped into or brought into the State of Montana, before delivery to the purchaser shall be unpacked from the boxes, and in case of baled or burlapped shipments these coverings shall be removed and stock shall be inspected and fumigated at Miles City, Billings, Dillon, Missoula, Kalispell, Great Falls, or Glasgow, which points are hereby designated as quarantine stations.

All nursery stock, trees, plants, vines, and cuttings brought into Montana by any transportation company shall be inspected and fumigated at the point of delivery, provided said point of delivery shall be one of the above-designated quarantine stations; but if any shipments shall be filled for delivery at any other points in Montana, they shall be inspected or fumigated at the quarantine

station on the line of such transportation company next preceding or nearest the point of delivery to which they are billed.

All such nursery stock, plants, trees, vines, cuttings brought into the State of Montana by wagon shall be inspected and treated at the nearest quarantine station, as hereinbefore mentioned, to the point where such nursery stock, trees, plants, vines, and cuttings enter the State.

The certificate of the inspector making such examination and inspection shall exonerate the shipper and consignee from any and all penalties provided by law.

RULE 3. Importers or owners of nursery stock, trees, vines, plants, and cuttings who shall desire to have such nursery stock, trees, plants, vines, and cuttings inspected and fumigated at points in Montana other than the regular quarantine stations, may have such inspection and fumigation made at any point designated by such importer or owner; provided, however, that such importer or owner shall pay all charges of inspection and fumigation and all expenses of the officer employed in such inspection and fumigation, such charges and expenses to be paid before the certificate is granted.

RULE 4. The inspector at large shall have authority to employ labor to assist the inspectors in any district whenever, in the judgment of the inspector at large, such assistance is necessary.

RULE 5. It shall be unlawful for any person to spray any tree, plant, or shrub, when the same is in bloom, with any substance injurious to bees or honey.

RULE 6. All special inspectors shall be appointed by the inspector at large, and shall hold office at his pleasure. Such appointments shall be approved by the member of the board for the district in which the same are made. All inspectors shall report to the secretary and inspector at large at least once a month, or as often as directed by said secretary and inspector at large.

RULE 7. All inspectors shall, as directed, report to the secretary of said board a complete statement of his doings, upon the proper blanks furnished for that purpose, together with an itemized bill for his labor for the time actually served by him during such week, which bill, when properly audited by the member of the State board of horticulture for the district in which said inspector shall labor, be again audited by the president and secretary of the State board of horticulture and forwarded to the State board of examiners for payment.

RULE 8. All inspection and fumigation shall be under the charge and supervision of the inspector at large, and all inspectors shall be responsible to him.

RULE 9. The inspectors appointed by this board and the special inspectors appointed by the inspector at large are authorized to inspect in their respective districts any and all nursery stock, trees, plants, shrubs, vines, and fruits, and to collect the fees prescribed in the law from the owner or person in control of such nursery stock or fruits wherever found. All fruits inspected and found free of any disease or infection shall be branded "Inspected and passed," together with the date of the inspection and number of district in which inspected, but if found to be infested with any injurious insects or disease shall be condemned and destroyed by burning by the inspector without exception.

RULE 10. The inspector in all districts shall receive as compensation for the inspection of fruits and nursery stock the sum total of all fees collected for such inspection: *Provided, however,* That the same shall not exceed the sum of \$5.00 per day for each day's work devoted to inspection, and all fees in excess of said sum shall be transmitted with the report of the inspector to the secretary.

RULE 11. The inspector at large shall have authority to go or send a competent person outside of the State to inspect any fruits or nursery stock to be shipped into the State whenever the party asking for such inspection shall defray the entire expense of such proceeding.

By fumigation it is to be understood treatment by hydrocyanic gas. This treatment shall be done as follows: All nursery stock to be treated should be placed in an air-tight tent or box. For every one hundred cubic feet of space in box or tent, take one ounce, avoirdupois weight, and fused potassium cyanide, ninety-eight per cent strength, preferably in lumps about the size of a walnut: one and one-half ounces commercial sulphuric acid, best grade, and two and one-fourth fluid ounces of water. First: Place the water in a three-gallon vessel (which may be glazed earthenware); to this add the acid and finally the potassium cyanide. (The cyanide would be better enclosed in a small paper bag in which a hole is torn.) Immediately close the doors or openings, taking all precautions against inhaling the gas, as it is one of the most violent poisons known. After leaving box or tent closed for forty minutes open all doors and allow at least one hour for thorough ventilation before attempting to remove stock. No injury is caused to nursery stock if the gas is left in for more than forty minutes.

NEBRASKA.

There is no law in Nebraska relating to the control of insects.

NEVADA.

AN ACT to protect and promote the horticultural interests of the State and to destroy insect pests in orchards and elsewhere.

SECTION 1. Whenever a petition is presented to the board of county commissioners of any county and signed by twenty or more persons who are resident freeholders and possessors of an orchard, or both, stating that certain or all orchards or nurseries, or trees of any variety, are infested with scale insect of any kind injurious to fruit, fruit trees, or vines, or are infested with codlin moth or other insects or pests that are destructive to trees or vines, and praying that a commissioner be appointed by them whose duty it shall be to supervise the destruction of such insects or trees as herein provided, the board of county commissioners shall, within twenty days after the presentation of such a petition, select and appoint a commissioner for the county, who shall be known as the county horticultural commissioner. The said commissioner shall serve for a period of two years from and after the date of his appointment and qualification or unless he shall be sooner removed by order of said board of county commissioners.

SEC. 2. It shall be the duty of the county horticultural commissioner in each county, whenever he shall deem it necessary, to make or cause to be made an inspection of any orchard or nursery or trees or any fruit-packing house, storeroom, salesroom, or any other place in his jurisdiction, and if found infested with scale bug, codlin moth, or other insect pests injurious to fruit, fruit trees, trees, or vines, he shall notify the owner or owners, or person or persons in charge or possession of said trees or place, as aforesaid, that the same are infested with the said insects, or any of them, or their eggs or larvæ, and he shall require such person or persons to disinfect or destroy the same within a certain time, to be specified. If within such specified time such disinfection or destruction has not been accomplished, the said person or persons shall be required to make application of such treatment, for the purpose of disinfection

or destruction of such insect pests, scale bug, or codlin moth, as may be prescribed by such commissioner.

SEC. 3. The notice provided for in section 2 shall be a written notice and may be served upon the person or persons owning and having charge or possession of such infested trees or places or articles as aforesaid by the commissioner or by any person deputed by him for that purpose; or they may be served in the same manner as a summons in a civil action. If the owner or owners, or any person or persons in charge or possession of any orchard or nursery or trees or places or articles infested with the said insects, or any of them, or their larvæ or eggs, after having been notified as above to destroy the same or make application of treatment as directed, shall fail, neglect, or refuse to do so, he or they shall be deemed guilty of maintaining a public nuisance, and any such orchards, nurseries, trees, or places, or articles thus infested shall be adjudged and the same is hereby declared to be a public nuisance, and may be proceeded against as such. If the owner or owners, person or persons aforesaid be found guilty, the court shall direct the aforesaid county horticultural commissioner to abate the nuisance. All the expenses or liabilities incurred in such proceeding, together with the costs, shall or may be a lien upon the real property of the defendant or property proceeded against.

SEC. 4. Said horticultural commissioner shall have power to divide the county into districts and to appoint a local inspector for each of said districts, who shall be known as "district horticultural inspectors," who shall serve without compensation, and who shall be subject to the supervision and control of the county horticultural commissioner, and whose authority may at any time be revoked. The county horticultural commissioner or his local inspectors shall have full power and authority to enter into any orchard, nursery, or place or places where trees or plants are kept and offered for sale or otherwise, or any house, storeroom, salesroom, depot, or any such place in their jurisdiction to inspect the same or any part thereof.

SEC. 5. The county horticultural commissioner shall be paid for each day actually engaged in the performance of his duty under this act, which amount or amounts shall be payable out of the county treasury of his county. The amount of compensation shall be fixed and determined by resolution of the board of county commissioners prior to the time of appointing such county horticultural commissioner.

SEC. 6. Before the person appointed as county horticultural commissioner enters upon the discharge of his duties, or at any time thereafter, the board of county commissioners may require a bond of such appointee, which bond shall be conditioned for the true and faithful performance of the duties of such appointee hereunder and which bond shall be in an amount, with sureties, to be fixed and approved by said board of county commissioners.

SEC. 7. If the county horticultural commissioner of any county shall fail or neglect to perform the duties of his office as required by this act he may be removed, and the district attorney of such county may institute a civil action to recover from the sureties on such bond all damages occasioned by such failure or neglect, or any person aggrieved thereby shall have a right of action upon such bond against the sureties thereon. In case of removal of such county horticultural commissioner or of vacancy, occasioned by death, resignation, or otherwise, the county commissioners may fill such vacancy thus formed by appointment.

SEC. 8. It shall be the duty of the county horticultural commissioner to keep a true and accurate record of his and his local inspectors' official acts hereunder and to make a quarterly report to the board of county commissioners, and they

may withhold any compensation due such commissioner until such time as such report is made.

SEC. 9. All acts and parts of acts in conflict with the above are hereby repealed.

Effective March 13, 1903.

NEW HAMPSHIRE.

AN ACT to authorize the State board of agriculture to appoint a State nursery inspector and to provide for the protection of trees and shrubs from injurious insects and diseases.

Be it enacted by the senate and house of representatives in general court convened:

SECTION 1. The State board of agriculture shall annually appoint some person, qualified by scientific training and practical experience, to be State nursery inspector, and he shall be responsible to the board for the performance of his duties as prescribed in this act. The said inspector may appoint such number of deputies, not exceeding two, as he may deem necessary or expedient.

SEC. 2. It shall be the duty of the State nursery inspector, either personally or through his deputies, to inspect at least once each year all nurseries or places in the State where nursery stock is grown, sold, or offered for sale, and if no dangerous insect or fungus pests are found therein a certificate to that effect shall be given. If such pests are found therein the owner of the stock shall take such measures to suppress the same as the State nursery inspector shall prescribe, and no certificate shall be given until the said inspector has satisfied himself by subsequent inspections that all such pests have been suppressed.

SEC. 3. Any owners of nurseries or of places in the State where nursery stock is grown, sold, or offered for sale, who do not hold an unexpired certificate of inspection after the first annual inspection made after the passage of this act, who shall sell or otherwise dispose of nursery stock in the State, shall be subject to a penalty of not less than twenty-five nor more than one hundred dollars for each offence.

SEC. 4. Any owners of nurseries or of places in the State where nursery stock is grown, sold, or offered for sale, who shall fumigate with hydrocyanic acid gas all stock which they sell, using at least two-tenths of a gram of potassic cyanide to every cubic foot of space contained in the box, house, or other place wherein this fumigation is performed, which place shall be gas tight, and who shall expose the said stock to the fumes of this gas of the strength aforesaid for at least forty minutes, or who shall treat the stock which they sell by some other method approved by the State nursery inspector, and who shall make affidavit before a justice of the peace that all stock sold by them has thus been fumigated or treated, and who shall attach a copy of such affidavit to each package, box, or car of stock sold, may be exempt from the provisions of sections two and three of this act.

SEC. 5. All nursery stock shipped into this State from any other State, country, or province shall bear on each box or package an unexpired certificate that the contents of said box or package have been inspected by a duly authorized inspecting officer, and that said contents appear to be free from all dangerous insects or diseases. In case nursery stock is brought within the State without such certificate the consignee shall return it to the consignor at the expense of the latter, or shall call the State nursery inspector to inspect the same: *Provided, however,* That any package or box bearing a certificate of fumigation

which meets the requirements specified in section four of this act may be accepted as though bearing a proper certificate of inspection.

SEC. 6. The State nursery inspector shall determine the season for inspecting nurseries and the forms of certificates to be given, but in no case shall he issue a certificate which shall continue in force after the first day of July next following the date of inspection. He or any of his deputies shall at all times have the right to enter any public or private grounds in the performance of any duty required by this act. The cost of said inspection shall not exceed \$300 annually.

SEC. 7. All parties violating this act shall be prosecuted by the secretary of the State board of agriculture.

SEC. 8. This act shall take effect upon its passage.

Approved March 4, 1903.

NEW JERSEY.

CHAPTER 249, LAWS, SESSION OF 1903.

AN ACT to prevent the introduction into and the spread of injurious insects in New Jersey, to provide a method for compelling their destruction, to create the office of State entomologist, to authorize inspection of nurseries, and to provide for certificates of inspection.

Be it enacted by the senate and general assembly of the State of New Jersey:

1. All gardeners, horticulturists, farmers, nurserymen, and other growers of or dealers in plants of any kind, upon their own or upon leased lands or premises, shall free and keep freed all plants, shrubs, trees, vines, cuttings, scions, buds, stocks, or other plant parts grown, cultivated, or dealt in by them from all injurious insects that might spread from the plants infested to others on the public highways or upon lands adjoining or belonging to others; all plants, shrubs, trees, or parts of such so infested are hereby declared to be a nuisance, to be abated as herein prescribed, and their maintenance after notice given as hereinafter set out is hereby declared a misdemeanor, punishable as hereinafter provided.

2. For the purposes of this act the entomologist of the State experiment station is hereby declared to be the State entomologist, to serve as such at such compensation as may be prescribed by the executive committee of the State board of agriculture, and said committee, which is hereby charged with the execution of this act, may appoint an assistant or deputy to the State entomologist, at such compensation as it may fix; said executive committee may also appoint such temporary assistants and inspectors as may be needed to carry out the provisions of this act, at such compensation as it may deem reasonable.

3. The term nursery as used in this act shall include any and all lands, premises, and buildings upon, on, or in which plants, trees, shrubs, or vines of any kind, whether for fruit, shade, or ornament, are grown for sale within the State or for shipment to other States or countries; the term nursery stock as used in this act shall be held to include any and all plants, shrubs, trees, and vines grown for sale, as well as buds, grafts, stocks, scions, and other parts of plants, shrubs, trees, and vines that may be sold for propagation; but it shall not apply to herbaceous annuals nor to plants, flowers, vines, or cuttings grown under glass and commonly known as florists' stock; the term nurseryman as used in this act shall be held to include any person, firm, copartnership, or corporation growing plants, trees, shrubs, or vines for sale, or dealing in such stock, whether he or they be owners, lessees, or tenants of or on the premises upon which such stock is grown or offered for sale.

4. It shall be unlawful for any nurseryman within the State to sell or offer for sale any nursery stock or to deliver the same within the State until it has been inspected by the State entomologist or his deputy, and until a certificate has been issued to him in accordance with the provisions of this act; it shall be the duty of every nurseryman growing stock within this State, and of every dealer in nursery stock, to attach to every car, box, bale, or parcel of stock sent out or delivered by him a written or printed copy of the certificate issued to him by the State entomologist, together with a written or printed copy of a declaration signed by such nurseryman, stating that the stock contained in such car, box, bale, or parcel was part of that covered by such certificate, and that the conditions upon which such certificate was issued have been fulfilled: such statement shall be considered a warranty as to the source of said stock, for a breach of which a certificate may be withdrawn by the State entomologist.

5. All nurserymen growing or dealing in nursery stock within this State must erect and maintain upon the nursery upon which their stock is grown, or in connection therewith, a structure suitable for fumigating nursery stock with hydrocyanic acid gas, which shall be inspected by the State entomologist, whose duty it shall be, if he finds the building properly constructed for the purposes, to mark upon the same the amounts of the materials to be used for the fumigation of the stock grown upon such nursery; said entomologist shall also direct the manner in which fumigation is to be done and the length of time during which the stock is to be exposed to the action of the gas.

6. It shall be unlawful for any nurseryman to send out or ship from his nursery any stock not thoroughly fumigated with hydrocyanic acid gas to any point within or without the State, unless such nurseryman holds a certificate from the State entomologist that the stock grown upon such nursery is free from dangerously injurious insect pests or those liable to become so: *Provided*, That this requirement shall not apply to evergreens, conifers, herbaceous plants, or to plants grown under glass only and known as florists' stock.

7. It shall be the duty of the State entomologist to examine and inspect, or cause to be examined and inspected, at least once in each year, at such time or times as he may determine, with or without notice to the nurseryman, all nurseries within the State, to ascertain whether the stock grown thereon is free from dangerously injurious insects and from such as, in his opinion, are likely to become so when transplanted or set out into orchard, vineyard, field, or garden, and every nurseryman within the State shall have the right to demand that such inspection be made in case his nursery has not been inspected prior to the first day of October in any year. No fee or other charge for inspections shall be made against any nurseryman.

8. After any nursery has been inspected it shall be the right of a nurseryman to demand of the State entomologist a certificate stating the condition of the stock on the inspected premises, and it shall be the duty of the State entomologist to give a certificate in accordance with the facts found. If the inspection shows the presence of dangerously injurious insects or of such as are likely to become so, the entomologist shall require of the nurseryman that he destroy the infested stock and that he treat that exposed to infection in such manner as may be necessary to render such insects harmless and the stock safe. If the inspection shows that a nursery is apparently free from dangerously injurious insects or from such as are liable to become so, the State entomologist shall issue his certificate to that effect, specifying in such certificate the date up to which it shall remain valid: *Provided*, That he may impose as a condition that the nurseryman comply with the requirements of section six of this act, and this condition must be accepted in writing by such nurseryman. Any nurseryman

whose premises have been found infested may, after he has complied with the requirements made by the State entomologist, apply for a reinspection of his stock, and the State entomologist shall, if he finds the conditions fulfilled and the stock apparently clean, issue his certificate to that effect upon such conditions as may be deemed necessary for the protection of purchasers; such conditions must be in writing and must be accepted by the nurseryman in writing.

9. It shall be the privilege of any nurseryman or dealer to ship under the certificate issued to him nursery stock grown for him elsewhere or purchased by him from other States or countries: *Provided*, That all such stock be received under a certificate satisfactory to the State entomologist that it had been inspected where grown and found to be apparently free from dangerously injurious insects or such as were liable to become so; and no such stock shall be sold within the State or shipped until the certificate accompanying it shall have been submitted to the State entomologist and approved by him.

10. Any nurseryman who sells or ships to points within the State without a certificate of inspection made, or without fumigation as prescribed in section six, shall be deemed guilty of a misdemeanor and subject to a fine of fifty dollars for every sale or shipment made in violation of sections four and six of this act; any nurseryman to whom a certificate has been issued, who shall use the same on stock not actually inspected, or who shall in any way fail to comply with the conditions upon which such certificate was issued or the requirements of this act shall be deemed guilty of a misdemeanor and subject to a fine of one hundred dollars for each offense, and his certificate may be withdrawn and cancelled, in the discretion of the State entomologist.

11. All nursery stock shipped into this State from any foreign state or country must be accompanied by a certificate, dated not more than six months prior to the date of such shipment, or by a written or printed copy of such certificate, attached to each car, box, bale, or parcel thereof, stating that the stock to which such certificate is attached has been inspected by an officer duly authorized by the laws of the State where such stock was grown and that the same was found to be free from dangerously injurious insects or from such as might be liable to become so when introduced into nursery, vineyard, farm, or garden; any such certificate shall be accompanied by a written or printed statement from the nurseryman shipping the same declaring that such stock is part of that which was inspected by or under the direction of the officer signing the certificate, and he shall further state whether or not such stock has been fumigated with hydrocyanic acid gas; any car, box, bale, or parcel of nursery stock shipped into this State, unaccompanied by a certificate as above required, may be seized and detained by the State entomologist or under his direction wherever found, whether in the hands of a common carrier or in the hands of the consignee or his agent, and such stock may be held and detained until the same has been inspected and found free from dangerously injurious insect pests and from such as in the judgment of said entomologist are liable to become so. In case any stock so examined is found to be infested as above described, it shall be the duty of the State entomologist, and he is hereby empowered, to destroy such infested stock, and he shall require such as may not be actually infested to be submitted to such treatment as he may deem necessary to make it safe and the insects that may be harbored in or on it harmless; it shall be also the duty of said entomologist when, in his opinion, there is reason to doubt the truth of any certificate or a nurseryman's statement thereunder found attached to any car, box, bale, or parcel of stock shipped into this State to detain such box, bale, or parcel of stock until the same has been inspected under his direction and in case such stock is found to be infested it may be treated as uncertified and all

future shipments received from the same nurseryman may be thereafter regarded and treated as uncertified.

12. It shall be the duty of the State entomologist, whenever complaint is made to him that any person, firm, or corporation is maintaining a nuisance as prescribed in section one of this act, to investigate or cause to be investigated, as soon as conveniently possible, the truth of such charge; if after such investigation he decides that such a nuisance exists, he shall notify, in writing, the owner or occupant of the premises containing the nuisance complained of, of the fact that such nuisance exists; he shall include in such notice a statement of the conditions constituting such nuisance, an order that the same be abated within a specified time, which shall not be less than ten days from the date of such notice nor less than eight days from the date of its service as herein prescribed, and a direction, written or printed, pointing out such methods as should be taken to abate the same; such notice and order may be served personally or by depositing the same in the post-office, properly stamped, addressed to the owner or occupant of the land or premises upon which such nuisance exists, and the directions for treatment may consist of a printed circular, bulletin, or report of the State or college experiment station or an extract from the same; in case the notice and order served as aforesaid shall direct that any growing plant, shrub, or tree shall be taken out and destroyed, and the owner or grower of such plant, shrub, or tree shall consider himself aggrieved thereby, he shall have the privilege of appealing, within three days after the receipt of the notice, to a committee of appeal, consisting of three members of the State board of agriculture to be appointed by the executive committee of said board for that purpose; the appeal must be in writing, directed to the secretary of the State board of agriculture at Trenton, and must contain a statement of the reasons why the order of the State entomologist is deemed unjust; written notice of such appeal served by mail upon the State entomologist shall operate to stay all proceedings until the decision of the committee of appeal, who may, after investigating the matter, reverse, modify, or confirm the order of the State entomologist; such decision shall then become the order of the State entomologist, who shall serve the same as hereinbefore set out and shall fix the time within which such decision must be carried out; the compensation and expenses of such committee of appeal shall be fixed by the executive committee of the State board of agriculture.

13. It shall be the privilege of any farmer, horticulturist, or other grower of fruits within this State to request an examination of his trees or other fruit-bearing plants, to determine whether or not they are infested by any dangerously injurious insect pest, and it shall be the duty of the State entomologist to examine or cause to be examined such trees or other fruit-bearing plants with all convenient despatch; in case such trees or plants are found to be so infested, it shall be the duty of the State entomologist to inform the owner as to the best methods of treating such trees and plants that they may be preserved, if possible, and the spread of such insects checked; this section shall be held to apply only to such insects as may endanger the life of the infested trees or plants and may spread from such as are already infested to others in their vicinity.

14. Any person, firm, or corporation failing to obey an order of the State entomologist made and served as prescribed in section twelve, within the period of time therein specified, shall be deemed guilty of a misdemeanor, and liable to punishment by a fine of fifty dollars besides the costs of the suit; and if the order of the State entomologist commanded the destruction of any trees, shrubs, plants, or nursery stock, the judgment of the court imposing the fine shall include also an order to the officer enforcing its judgments to seize and destroy the specified trees, shrubs, plants, or nursery stock, in accordance with

the order, which the said officer shall thereupon be fully authorized to do; fines recovered under this act shall be collected and chargeable as are other judgments of the court imposing the same.

15.^a All proceedings to enforce the provisions of this act shall be brought in the name of and prosecuted by the State board of agriculture through the committee of appeal appointed by the executive committee of the board, as prescribed in section twelve of this act, and in any court of competent jurisdiction in the county in which the offense complained of shall have been committed; action by said committee shall be based upon a report from the State entomologist, certifying the character of the offense committed and the proof supporting the charge; all fines and costs shall, after deducting therefrom the necessary costs of prosecution, be paid into the treasury of the State, accompanied by a statement showing the amount collected and the cost of collecting the same.

16. For the purpose of making the inspections, examinations and investigations specified in this act, and to enforce the provisions of the same, the State entomologist and his duly appointed deputy may enter upon any lands, open or inclosed, upon which such inspections, examinations, and investigations are necessary or where any nuisance as defined in section one of this act is maintained or charged, and into any storehouse or building containing nursery stock which he is herein directed or entitled to inspect, and any interference with or obstruction made to the entomologist or his deputy while engaged in the performance of the duties herein imposed shall subject the offender to punishment as a disorderly person under the general laws of this State upon a charge made against him by the officer interfered with.

17. The sum of three thousand dollars annually is hereby appropriated to the State board of agriculture for the purposes of this act: *Provided*, That no payment shall be made pursuant to this act until the amount thereof shall have been included in the annual appropriation bill.

18. Chapter one hundred and four, laws of one thousand eight hundred and ninety-eight, bearing the same title as the present act, is hereby repealed.

19. This act shall take effect immediately.

Approved April 14, 1903.

AN ACT to amend an act entitled "An act to prevent the introduction into and the spread of injurious insects in New Jersey, to provide a method for compelling their destruction, to create the office of State entomologist, to authorize inspection of nurseries, and to provide for certificates of inspection," approved April fourteenth, one thousand nine hundred and three.

Be it enacted by the senate and general assembly of the State of New Jersey:

1. Section fifteen of the act to which this is an amendment is hereby repealed and the following substituted:

15. Proceedings to enforce the provisions of this act shall be brought in the name of and prosecuted by the State board of agriculture, through the committee of appeal appointed by the executive committee of the board, as prescribed in section twelve of this act; every district court and every justice of the peace in any city or county, and every police justice or recorder in any city, is hereby empowered, on complaint under oath or affirmation made according to law that any person or persons has or have violated any of the provisions of this act, to issue process in the name of the State board of agriculture of the State of New Jersey as prosecutor, for the use of the State of New Jersey; said oath or

^a See act approved March 22, 1904, for amendment of this section.

affirmation may be made upon information and belief by any member of said committee of appeal and the complaint shall be based upon a report from the State entomologist certifying the character of the offense committed and the proof supporting the charge: said process shall be in the nature of a summons, returnable in not less than one nor more than ten entire days, and shall state what section of the law is alleged to have been violated by the defendant or defendants: at the return of said summons or at any time to which the trial shall have been adjourned the said district court, justice of the peace, police justice, or recorder, shall proceed summarily to hear the testimony and to determine and give judgment in the matter without the filing of any pleadings, either for the prosecutor for the recovery of the fine or penalty incurred, with costs, or for the defendant or defendants: if such judgment be for the prosecutor as aforesaid it shall state the character of the complaint, the section of this act under which the proceedings were taken, the date of the trial, the names of the witnesses who testified for the prosecutor, the names of the witnesses who testified for the defendant, the amount of the fine or penalty for which judgment is given, which shall be the sum specified in the section of this act under which the proceedings were taken and the judgment obtained, the amount of costs assessed against the defendant which shall be the costs allowed by the provisions of the act entitled "An act concerning district courts," approved June fourteenth, in the year one thousand eight hundred and ninety-eight: such other or further orders to the officer authorized by law to enforce such judgment as are provided for in section fourteen of this act, and that execution do issue against the goods and chattels of said defendant for the amount of said fine or penalty and costs: said judgment shall be signed by the judge of the district court, justice of the peace, police justice, or recorder giving the same: the officers to serve any process or execution issued as aforesaid shall be the county constables, and within the jurisdiction of any district court shall include the sergeant-at-arms thereof, which service and execution shall in all cases be made in the same manner and under the same liabilities that other processes and executions issued out of the district courts of this State are served and executed under and by virtue of the act concerning district courts cited above; all fines or penalties and costs shall be paid by the officer collecting the same to the treasurer of the State board of agriculture who shall, after deducting therefrom the necessary costs of prosecution, pay the balance into the treasury of the State, accompanied by a statement showing the amount collected and the cost of collecting the same; said officer executing the judgment shall also, if it contains an order to seize and destroy trees, shrubs, or other plants, make return to the court from which the execution issued, stating that the order has been carried out, or if it has not been carried out, the reasons why the judgment of the court could not be enforced.

2. This act shall take effect immediately.

Approved March 22, 1904.

NEW MEXICO.

CHAPTER 107, LAWS OF 1903.

AN ACT to create county boards of horticultural commissioners in the Territory of New Mexico, and to promote the horticultural interests in said Territory.

Be it enacted by the legislative assembly of the Territory of New Mexico:

SECTION 1. Within twenty days after the passage of this act it shall be incumbent upon the county commissioners of each county of New Mexico, on petition

of ten tax-paying citizens of said county, to select three competent persons, fruit growers or owners of orchards, residents of such county, who shall be known as the county board of horticultural commissioners. The board of county commissioners shall fill any vacancy that may occur in said board by death, resignation, or otherwise, and appoint one horticultural commissioner each year, or thereabouts, one month, or thereabouts, previous to the expiration of the term of office of any member of the said county board of horticultural commissioners. Said county board of horticultural commissioners shall serve for a term of three years from date of appointment, except the commissioners first appointed, one of whom shall serve for one year, one of whom for two years, and one of whom for three years, from date of appointment. The commissioners first appointed shall themselves decide by lot or otherwise who shall serve for one year, who shall serve for two years, and who shall serve for three years, and shall notify the board of county commissioners of the result of their choice.

SEC. 2. It shall be the duty of the county board of horticultural commissioners in each county, whenever it shall deem it necessary, to cause an inspection to be made of any orchard, or nursery, or trees, or any fruit packing house, store-room, sales-room, or any other place in their jurisdiction, and if found infested with scale bug, codlin moth, or other insect pest injurious to fruit, trees, and vines, they shall notify the owner or owners, or person or persons in charge or possession of said trees or place aforesaid that the same are infested with said insects, or any of them, or their eggs or larvæ, and they shall require such person or persons to disinfect or destroy the same within a certain time, to be specified: *Provided*, That no spraying of trees while in bloom shall be required to be done. If within such time such disinfection or destruction has not been accomplished, the said person or persons shall be required to make application of such treatment, for the purpose of destroying them, as said commissioners may prescribe. Said notices may be served upon the person or persons owning or having charge or possession of such infested trees, or places, or articles as aforesaid, by any commissioner or by any person deputed by the said commissioners for that purpose, or they may be served in the same manner as a summons in a civil action. If the owner or owners, or persons in charge or possession of any orchard, or nursery, or trees, or places, or articles infested with said insects, or any of them, or their larvæ or eggs, after having been notified as above to destroy the same or make application of treatment as directed, shall fail, neglect, or refuse to do so, he or they shall be deemed guilty of maintaining a public nuisance, and any such orchards, nurseries, trees, or places, or articles thus infested shall be adjudged and the same is hereby declared a public nuisance, and may be proceeded against as such. If found guilty, the court shall direct the aforesaid county board of horticultural commissioners to abate the nuisance. The expenses thus incurred shall be a lien upon the real property of the defendant.

SEC. 3. The said county board of horticultural commissioners shall have power to divide the county into districts and to appoint a local inspector for each of said districts. The board of county commissioners of each county shall issue commissions as quarantine guardians to the members of said county board of horticultural commissioners, and to the local inspectors thereof. The said quarantine guardians, local inspectors, or members of said county boards of horticultural commissioners, and to the local inspectors thereof. The said chard, nursery, or place or places where trees or plants are kept and offered for sale, or otherwise, or any house, storeroom, sales room, depot, or any other such place in their jurisdiction, to inspect the same, or any part thereof.

SEC. 4. It shall be the duty of said county board of horticultural commis-

sioners to keep a record of their official doings and to make a report to the board of county commissioners on or before the first day of October of each year of the condition of the fruit interests in their several districts, what is being done to eradicate insect pests, also as to the disinfecting and as to quarantine against insects, pests, and diseases, and as to carrying out all laws relative to the greatest good of the fruit interest. Said board of county commissioners shall incorporate so much of said report as may be of general interest in their annual report, which they shall make to the governor of said Territory on or before the first day of December of each year.

SEC. 5. Each member of the county board of horticultural commissioners, and each local inspector, shall be paid for each day actually engaged in the performance of his duties under this act, payable out of the county treasury of this county, such compensation as shall be determined by resolution of the board of county commissioners of the county before entering into the discharge of his or their duties.

SEC. 6. Said county board of horticultural commissioners shall have power to remove any local inspector who shall fail to perform the duties of his office. If any member of the county board of horticultural commissioners shall fail to perform the duties of his office, as required by this act, he may be removed from office by the board of county commissioners and the vacancy thus formed may be filled by appointment by said board of county commissioners. In addition to the annual report required by section 5 of this act, the county board of horticultural commissioners shall make a monthly report of their doings to the board of county commissioners, and the board of county commissioners may withhold warrant for their salary or compensation of said members and inspectors thereof until such time as said report is made.

SEC. 7. The county board of horticultural commissioners may receive, manage, use, and hold donations and bequests for promoting the objects of its formation. It shall meet semiannually, and as much oftener and at such places as it may deem expedient, to consult and adopt such measures as may best promote the horticultural industry of the county. It may, but without expense to the county, select and appoint competent and qualified persons to lecture in the county for the purpose of illustrating practical horticultural topics and imparting instruction in the methods of culture, pruning, fertilizing, and also in the best methods of treating diseases of fruits and fruit trees, cleansing orchards, and exterminating insect pests. The county board of horticultural commissioners shall at their first meeting select from among themselves a chairman, a secretary, and a treasurer, who shall furnish bond to the county commissioners in the sum of five hundred dollars (\$500.00) for the faithful discharge of his duties.

SEC. 8. The chairman shall preside at all meetings of the board, shall countersign all checks for moneys paid out, and shall sign all contracts to which the county board of horticultural commissioners is a party: *Provided*, The same shall have been approved by the board. He shall have power to call a meeting of the board at any time he deems it necessary, whenever requested by a majority of the board, or when requested in writing by six of the resident fruit growers.

SEC. 9. The secretary shall attend all meetings of the board and preserve records of its proceedings and all its correspondence, collect and preserve such books, pamphlets, periodicals, and other documents as may be of interest to the horticulturalist, and to correspond with agricultural and horticultural societies and colleges and what other persons and bodies as he may be directed by the board. He shall also prepare such reports as are required by the board and perform such other duties as will pertain to the office.

SEC. 10. The duties of the treasurer shall be to receive and safely keep all moneys of the board. He shall pay out the same only for bills approved by the board and shall render a detailed account to the board before the first of October of each year, or as often as may be required by the board, showing the amount of money received by the board and paid out by him. At the expiration of his term of office he shall turn over to his successor in office all moneys, books, and papers of the board. He shall give bond in sum as provided for.

Approved March 19, 1903.

NEW YORK.

AGRICULTURAL LAW OF THE STATE OF NEW YORK, AS AMENDED TO JULY, 1905.

ARTICLE VI.

§ 82. *The prevention of disease in fruit trees and the extirpation of insect pests that infest the same.* No person shall knowingly or wilfully keep any peach, almond, apricot, or nectarine trees affected with the contagious disease known as yellows. No person shall knowingly or wilfully keep any peach tree affected with the disease known as little peach. Nor shall any person knowingly or wilfully keep any plum, cherry, or other trees affected with the contagious disease or fungus known as black knot, nor any tree, shrub, or plant infested with or by the San José scale or other insect pest dangerously injurious to or destructive of the trees, shrubs, or other plants; every such tree, shrub, or plant shall be a public nuisance, and as such shall be abated, and no damage shall be awarded for entering upon premises upon which there are trees, shrubs, or plants infected with yellows, little peach, or black knot, or infested with San José scale, for the purpose of legally inspecting the same; nor shall any damage be awarded for the destruction by the commissioner of agriculture, or his duly authorized agents or representatives, of such trees, shrubs, or plants, or altogether destroying such tree, if necessary to suppress such disease, if done in accordance with the provisions of this article, except as otherwise herein provided. Every person, when he becomes aware of the existence of such disease or insect pest in any tree owned by him, shall forthwith report the same to the commissioner of Agriculture at Albany, New York, and the said commissioner shall take such action as the law provides. If in the judgment of said commissioner of agriculture or the person or persons representing him, the trees, shrubs, or other plants so infected, infested, or diseased should be destroyed, then such destruction shall be carried on and completed under the supervision of the commissioner of agriculture or the person or persons duly appointed by him and authorized so to do, without unnecessary delay; but the owner of the trees, shrubs, or plants shall be notified immediately upon it being determined that such trees, shrubs, or plants should be destroyed by a notice in writing signed by said commissioner or the person or persons representing him, which said notice in writing shall be delivered in person to the owner of such trees, shrubs, or plants, or left at the usual place of residence of such owner, or if such owner be not a resident of the town, by leaving such notice with the person in charge of the premises, trees, shrubs, or plants, or in whose possession they may be; such notice shall contain a brief statement of the facts found to exist whereby it is deemed necessary to destroy such trees, shrubs, or plants, and shall call attention to the law under which it is proposed to destroy them, and the owner shall within ten days from the date upon which such notice shall have been received remove and burn all such diseased or infested trees, shrubs,

or plants. If, however, in the judgment of the commissioner of agriculture any trees, shrubs, or plants infected with any disease or infested with dangerously injurious insects can be treated with sufficient remedies he may direct such treatment to be carried out by the owner under the direction of the commissioner's agent or agents. Any person refusing or failing to comply with the directions of the commissioner of agriculture or his duly authorized agents in carrying on the work of extirpating dangerously injurious insect pests and fungus or other diseases shall be guilty of a misdemeanor. In case of objections to the findings of the inspector or agent of the commissioner of agriculture an appeal shall be made to the commissioner of agriculture, whose decision shall be final. An appeal must be taken within three days from service of said notice, and shall act as a stay of proceedings until it is heard and decided. When the commissioner of agriculture, or the person or persons appointed by him, shall determine that any tree or trees, shrubs, or other plants must be treated or destroyed forthwith, he may employ all necessary assistants for that purpose, and such person or persons, agent or agents, employee or employees may enter upon any or all premises in any city or town necessary for the purpose of such treatment, removal, or destruction. (*As amended by chapter 20 of the laws of 1903.*)

§ 83. *Appointment and duties of the agent of the commissioner of agriculture.* When the commissioner of agriculture knows and has reason to believe that any such contagious disease exists, or that there is good reason to believe it exists, or danger is justly apprehended of its introduction in any town or city in the State, or that any dangerously injurious insect pest exists within this State, and has reason to believe that danger may be justly apprehended from its existence, he shall forthwith send some competent person and such agent or agents as he may deem necessary to assist in extirpating said pest or pests, disease or diseases, and the said commissioner of agriculture is hereby authorized and empowered to take such steps and do whatever may be deemed necessary to so control or prevent the spread or extirpate said pest or pests, disease or diseases, and he shall cause an examination to be made at least once each year, prior to September first, of each and every nursery or other place where trees, shrubs, or plants, commonly known as nursery stock, are grown for sale, for the purpose of ascertaining whether the trees, shrubs, or plants therein kept or propagated for sale are infected with any such contagious disease or diseases or infested with such pest or pests. If after such examination it is found that the said trees, shrubs, or other plants so examined are free in all respects from any such contagious or infectious disease or diseases, dangerously injurious pest or pests, the said commissioner or his duly authorized agent or other person designated to make such examination shall thereupon issue to the owner or proprietor of the said stock thus examined a certificate setting forth the fact that the stock so examined is apparently free from any and all such disease or diseases, pest or pests. Should any nurseryman, agent, or dealer or broker send out or deliver within the State trees, vines, shrubs, plants, buds, or cuttings, commonly known as nursery stock, and which are subject to the attacks of insects and diseases above provided for, unless he has in his possession a copy of said certificate, dated within a year thereof, deface or destroy such certificate, or wrongfully be in possession of such certificate, he shall be guilty of a misdemeanor. All nursery stock consigned for shipment, or shipped by freight, express, or other means of transportation, shall be accompanied by a copy of said certificate attached to each car, box, bale, bundle, or package. Any person consigning for shipment or shipping nursery stock as above without such certificate attached shall be guilty of a misdemeanor. All transportation companies within this State receiving or carrying nursery stock from any point

without the State to any point within the State shall immediately, upon receiving such consignments, notify the commissioner of agriculture of the fact that such consignment is in their possession, giving the name of the consignor and consignee and the point of destination of such consignment. All trees, plants, shrubs, buds, or cuttings, commonly called nursery stock, grown in any nursery in this State in which San José scale has been found within two years of the date of the dissemination of said nursery stock or grown in said nursery within one-half a mile of where said scale was found, and also all nursery stock from outside of this State disseminated or planted in this State after the first day of July, nineteen hundred and two, must be fumigated with hydrocyanic gas in such manner as may be directed by the commissioner of agriculture of this State. Such fumigation must be done by the grower, consignor, or consignee of such stock before planting, dissemination, or reshipment, except such trees, shrubs, plants, buds, or cuttings grown in this State as are planted by the grower or propagator for himself or such as from its nature or state of growth would be exempt; in such cases the said commissioner shall declare such trees, shrubs, plants, buds, or cuttings free from such treatment. All nursery stock brought into this State from outside of this State must be accompanied by a certificate from the consignor that it has been fumigated as aforesaid. Should any such stock arrive without such certificate, the transportation company delivering it shall at once notify the said commissioner to that effect. The consignee shall also at once notify him of that fact and shall proceed to fumigate said stock, as directed by the commissioner of agriculture, without delay. Should any nursery stock purchased within one year be found infested with San Jose scale on the premises of any nurseryman, it shall not be considered such an infestation as to require the fumigation of other stock not so purchased. The words "nursery stock," wherever used in this article, shall apply to and include all trees, shrubs, plants, buds, willow grown for nursery, baskets, or other commercial purposes, or cuttings, whether grown in a nursery or elsewhere, so far as it relates to fumigation. The provisions of this and the preceding section shall not apply to florists' greenhouse plants, flowers, or cuttings, commonly known as greenhouse stock, and no certificate shall be required for shipment of native stock collected in the United States not grown in nurseries, nor to stock so shipped into the State that its sale and shipment become either interstate-commerce traffic or commerce with foreign nations. (*As amended by chapter 519 of the laws of 1902.*)

NORTH CAROLINA.

CHAPTER 264, LAWS OF 1897.

AN ACT to prevent the introduction and dissemination of dangerous insect, fungous, and weed pests of crops.

The general assembly of North Carolina do enact:

SECTION 1. That for the purpose of this act the State commissioner of agriculture, the director of the North Carolina agricultural experiment station, and the president of the North Carolina State horticultural society are hereby constituted a commission for the extermination of noxious insects, fungous diseases, and weeds which are affecting or may affect crops. They are empowered to elect one of their number chairman, and to adopt rules and regulations for their own government, such as may be requisite for carrying out the provisions of this act. The members of the said commission shall receive no salary, and shall

be allowed only such expenses as have been specifically incurred and necessary in attending the meetings of the commission.

SEC. 2. The members of the commission aforesaid shall hold a meeting within thirty days after the ratification of this act, and shall prepare and publish a list of dangerous crop pests, known to be present within the State or liable to be introduced, and may at any subsequent meeting extend or amend said list. The commission shall also publish methods for exterminating such pests as they may deem capable of being economically exterminated within the boundaries of the State, and for repressing such as can not be economically exterminated, and for preventing the spread of such pests within the State. They may also adopt regulations, not inconsistent with the laws and constitution of this State and the United States, for preventing the introduction of dangerous crop pests from without the State, and for governing common carriers in transporting plants liable to harbor such pests to and from the State, and such regulations shall have the force of laws.

SEC. 3. No person, firm, or corporation shall knowingly and wilfully keep upon his or their premises any plant infested by any dangerous crop pest listed and published as such by the said commission, or permit dangerous weed pests to mature seed or otherwise multiply upon their land except under such regulations as the commission may prescribe. Every such infested plant and premises are hereby declared a public nuisance. The owner of such plants or premises shall, when notified to do so by the commission, take such measures as may be prescribed to eradicate such pests, and if such action is not taken, or is improperly executed within ten days after being so notified, the commission shall cause said premises to be freed from such pests by the best available method, and the cost of such work shall be a lien against such premises, and may be recovered, together with cost of action, before any court in the State having competent jurisdiction. Said notice shall be written and mailed to the usual or known address, or left at the ordinary place of business of said owner or his agent. No damage shall be awarded the owner of such premises for entering thereon and destroying or otherwise treating any infested plant or crop, when done by the order of the commission.

SEC. 4. When said commission has reason to suspect that any pest listed by them as dangerous exists in any county in the State, they shall cause such suspicion to be verified by a person competent to determine the specific identity of such pests of crops, and if such suspicion prove founded upon fact, shall further appoint, for a designated time and duty, a competent person their agent to inspect such infested premises and to take such measures for treating the same as the commission may direct. Any duly authorized agent of the commission shall have authority to enter upon and inspect any premises between the hours of sunrise and sunset during every working day of the year. Any one who shall seek to prevent such inspection, or who shall otherwise interfere with any agent of the commission while in performance of his duties, shall, upon conviction, be fined not less than \$5 nor more than \$50 for each offense, or may be imprisoned for not less than ten nor more than thirty days.

SEC. 5. For the purposes of carrying out the provisions of this act, the sum of \$500 per annum, or so much thereof as is necessary, is hereby appropriated, out of any funds in the treasury not otherwise appropriated, and shall be paid by the State treasurer upon properly authenticated vouchers signed by the chairman of the commission.

SEC. 6. The said commission shall report to the governor, for transmission to the next general assembly, its acts and disbursements under the provisions of this act. Such a report, together with all such circulars as may be issued by the

said commission for the purposes of this act, shall be printed in editions of one thousand copies by the public printer, and be paid for as other public printing.

SEC. 7. All laws and clauses of laws inconsistent with this act are hereby repealed.

SEC. 8. This act shall take effect from and after its ratification.

Ratified the 5th day of March, A. D. 1897.

RULES CONCERNING NORTH CAROLINA NURSERIES.

Definition of "nursery stock."—In these rules * * * the term "nursery stock" is construed to include all fruit and nut trees, currant and gooseberry plants, and all such shade and ornamental trees as shed their leaves in winter (*i. e.*, deciduous trees), whether they be grown especially for sale or taken from the forest. It also includes all buds, grafts, scions, and cuttings from same.

It does not include palms, ferns, rubber plants, evergreens (including pines, cedars, and junipers), hedge plants, cut flowers, and such other plants as are commonly known as florists' stock, whether they be grown for sale or taken from the forest. Nor does it include wild herbaceous plants which may be collected and sold as botanical specimens or for medicinal uses.

Exceptions.—Raspberry, blackberry, and strawberry plants, grapevines, rose-bushes, euonymus, magnolias, and osage orange are not here included under the term "nursery stock," but if known to be infested with the San Jose scale or other similarly serious pests will be subject to same rules as regular nursery stock which is infested.

Special note.—Persons within the State of North Carolina who grow plants of the kinds named as "exceptions" in the preceding paragraph, and who ship such stock into other States, must make application to this commission to have their premises inspected each year, for some other States prohibit the sale of such stock within their borders unless it has been inspected. But those who grow such plants for sale only in North Carolina need not have their premises inspected unless this commission shall so decide.

Definition of "nursery."—Any place upon which is grown, for purposes of sale, barter, or exchange, any of the plants or parts thereof which have been defined as nursery stock, shall be considered as a nursery, no matter how few may be the number of plants. This does not include those who grow stock solely for their own use.

RULE 1. No person, firm, or corporation shall sell, offer for sale, exchange, barter, or give away any such plants or parts of plants above described as nursery stock, and which are grown within the State of North Carolina, unless in possession of a valid certificate of inspection previously obtained from this commission.

RULE 2. Every carload, box, bale, package, or delivery of nursery stock (even if it be only a single tree) which is sold, exchanged, bartered, or given away by any person, firm, or corporation whose place of business is in North Carolina, shall be accompanied by a valid copy of the certificate of inspection plainly and securely attached. And any nursery stock being shipped for delivery which is not accompanied by such copy of certificate is declared to be a public nuisance and is liable to be destroyed without compensation to the consignor. And no agent of any transportation company or common carrier can accept for transportation, within the State of North Carolina, any shipment of stock not accompanied by such copy of certificate, plainly and securely attached.

RULE 3. If any trees, plants, or parts thereof, being shipped for delivery at any point in North Carolina, whether or not included under the term nursery stock, and whether or not accompanied by a certificate of inspection, are found by any agent of this commission to be infested with living San Jose scale, such entire shipment is declared to be a public nuisance and is liable to destruction without compensation to the consignor.

RULE 4. Each nursery in the State shall be inspected at least once each year by the entomologist or his assistants or other authorized officer, in order to determine whether insect or other pests of such nature as to be a serious menace to the purchaser are present on the stock offered for sale. If the stock is apparently free from such serious pests and otherwise in good condition, and the person, firm, or corporation is apparently conducting his or its business in an honorable manner, a certificate of inspection of nursery stock shall be issued.

RULE 5. In case nursery stock in any nursery in the State be found to be infested with such pests as to render the sale of the plants a serious menace to the welfare of the purchaser, the certificate of inspection shall not be issued until the premises have been so treated that the salable stock to be covered by the certificate shall be apparently free from the pest or pests indicated, and the treatment to be applied shall be such as the entomologist or other officer making the inspection shall prescribe.

RULE 6. When it is required that infested nursery stock shall be destroyed, fumigated, or otherwise treated, the statement of the person, firm, or corporation that such treatment has been given may be accepted as evidence that the requirement has been fulfilled, but the certificate may be withheld pending investigation, should the entomologist or other authorized officer have reason to doubt the thoroughness of the work done or the truthfulness of the statement.

RULE 7. All trees, buds, grafts, scions or cuttings of apple, apricot, cherry, peach, pear, plum, and quince which shall be sold, exchanged, bartered, or given away, and which are grown within the State of North Carolina, shall be fumigated with hydrocyanic-acid gas shortly before shipment or delivery in a tight box or room suitable for the purpose, in accordance with directions furnished by the entomologist or other authorized officer.

RULE 8. This commission reserves the right to permanently withdraw the certificate of any person, firm, or corporation within the State of North Carolina which shall make any false statement concerning treatment of nursery stock, for any violation of the above rules, for any false statement to customers regarding fumigation of stock, or for fraudulent practices carried on through the use of the certificate of this commission. False and preposterous claims of any kind evidently made to deceive the customer may be considered as evidence of fraud.

RULES GOVERNING THE TRANSPORTATION OF NURSERY STOCK IN NORTH CAROLINA.

[Definition of "nursery stock," etc., same as under preceding heading.]

RULE 1. No transportation company or common carrier shall deliver to any consignee in this State any carload, box, bale, package, or specimen of nursery stock unless same shall have plainly attached thereto a valid certificate of inspection made in favor of the consignor, stating that the premises of the consignor have been inspected and that the salable stock growing thereon was apparently free from the San Jose scale or other dangerous insect or contagious disease and otherwise in good condition.

RULE 2. If any nursery stock be presented to any transportation company or

common carrier at any point within the State of North Carolina or for delivery in said State, and such stock be not accompanied by a valid certificate of inspection plainly and securely attached, the company or its agent shall refuse same for transportation, and shall at once report the case to the entomologist, stating the name of the consignor, consignee, and nature of the stock, and the entomologist shall advise as to the course to be followed. Such a shipment is declared to be a public nuisance, and may be destroyed by any agent of this commission or on his written order, without compensation to the consignor.

RULE 3. Any trees or plants being shipped to or from any point in North Carolina, whether or not they be of the kinds above defined as nursery stock, and whether or not they be accompanied by a certificate of inspection, are hereby declared to be a public nuisance if found by any agent of this commission to be infested with the San Jose scale or other dangerous insect or contagious disease, and such stock may be destroyed by any agent of this commission or by his written order, without compensation to the consignor.

RULES AND SUGGESTIONS APPLYING TO NURSERIES OUTSIDE OF NORTH CAROLINA
WHICH DO BUSINESS IN THE STATE.

RULE 1. No person, firm, or corporation shall sell, offer for sale, exchange, barter, or give away within the State of North Carolina any such plants as are above defined as nursery stock unless such person, firm, or corporation is in possession of a valid certificate of inspection issued by the properly authorized officer of the State where such stock is grown, and such certificate must state that the premises of such person, firm, or corporation have been inspected and that the growing of salable stock covered by the certificate is apparently free from San Jose scale.

RULE 2. Every carload, box, bale, or package (even if it be only of a single tree) of nursery stock which is sent into the State of North Carolina for delivery must be accompanied by a valid copy of the certificate of inspection, which shall be plainly and securely attached. This shall be construed to mean that a shipment, no matter how large, if sent in one lot at one time and to one consignee, may be covered by a single copy of the certificate. And any shipment of nursery stock not accompanied by such a certificate is declared to be a public nuisance and is liable to be destroyed without compensation to the consignor.

RULE 3. If any trees, plants, or parts thereof, being shipped for delivery at any point in North Carolina, whether or not included under the term "nursery stock," and whether or not accompanied by a certificate of inspection, are found by any agent of this commission to be infested with living San Jose scale, such entire shipment is declared to be a public nuisance and is liable to destruction without compensation to the consignor.

RULE 4. Every person, firm, or corporation outside of the State, and who desires to do business within the State of North Carolina, is required to file with the entomologist a copy of the certificate of inspection, which shall be valid for the ensuing season, and upon filing such certificate with the entomologist such person, firm, or corporation is at once qualified to ship nursery stock into the State.

RULE 5. This commission reserves the right to forbid transportation companies or common carriers from delivering within the State of North Carolina the stock of any person, firm, or corporation if it has reason to believe that the trade of such party is being fraudulently conducted. False and preposterous claims evidently made to deceive the purchaser may be considered as evidence of fraud.

QUARANTINE AGAINST THE MEXICAN COTTON BOLL WEEVIL.

[The following regulation has been adopted by the North Carolina crop pest commission as a protection against the Mexican cotton boll weevil:]

SECTION 1. The following counties in Texas and parish in Louisiana are considered to be localities infested with boll weevil: In Texas the counties of Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bell, Bexar, Blanco, Bosque, Bowie, Bransoria, Brazos, Brown, Burleson, Burnet, Caldwell, Calhoun, Cameron, Camp, Cass, Chambers, Cherokee, Collin, Colorado, Comal, Comanche, Cooke, Coryell, Dallas, Delta, Denton, Dewit, Duval, Eastland, Ellis, Erath, Falls, Fannin, Fayette, Fort Bend, Franklin, Freestone, Galveston, Gillespie, Goliad, Gonzales, Grayson, Gregg, Grimes, Guadalupe, Hamilton, Hardin, Harris, Harrison, Hays, Henderson, Hidalgo, Hill, Hood, Hopkins, Houston, Hunt, Jack, Jackson, Jasper, Jefferson, Johnson, Karnes, Kaufman, Kendall, Lamar, Lampasas, Lavaca, Lee, Leon, Liberty, Limestone, Live Oak, Llano, Madison, Marion, Matagorda, McLennan, McMullen, Milan, Mills, Montague, Montgomery, Morris, Nacogdoches, Navarro, Newton, Nueces, Orange, Palo Pinto, Panola, Parker, Polk, Rains, Red River, Refugio, Robertson, Rockwall, Rusk, Sabine, San Augustine, San Jacinto, San Patricio, San Saba, Shelby, Smith, Somervell, Starr, Stephens, Tarrant, Titus, Travis, Trinity, Tyler, Upshur, Van Zandt, Victoria, Walker, Waller, Washington, Wharton, Williamson, Wilson, Wise, and Wood. In Louisiana, Sabine Parish. Also all other counties or parishes in which the boll weevil shall hereafter be found.

SEC. 2. The introduction into North Carolina from any county or parish where the cotton boll weevil is known to exist (as enumerated in section 1) of cotton, cotton seed, cotton-seed meal, cotton-seed hulls, cotton-seed sacks (which have been used), and corn in the shuck, is absolutely prohibited at all seasons.

SEC. 3. *Except during the months of July, August, and September*, the following articles are subject to restrictions set forth in section 2, namely: Hay, straw, sacked wheat, sacked oats, sacked shelled corn, sacked cowpeas, and unbaled Spanish moss. During the months of July, August, and September these articles are not restricted.

SEC. 4. The following articles are not restricted in their importation into North Carolina at any time (provided that none of the articles enumerated in sections 2 and 3 are used in packing), namely: Fruit, truck, rice, and rice grain products; *but*, if they be packed with such articles as are enumerated in sections 2 and 3, then the restrictions set forth in sections 2 and 3 will apply.

SEC. 5. All shipments of household goods into North Carolina from the localities enumerated in section 19 are prohibited, unless they be accompanied by an affidavit, attached to the way-bill, to the effect that the shipment contains no cotton, cotton seed, seed cotton, cotton-seed hulls, cotton-seed sacks, corn in the shuck, straw, hay, or loose Spanish moss; *except* during the months of July, August, and September, when hay, straw, Spanish moss, and shucks may be used in packing.

SEC. 6. Shipments of all such articles as are quarantined against in the foregoing sections, which are passing through but are not for delivery in this State, must be made in tight, closed box cars.

SEC. 7. In this State no transportation company or other common carrier shall use for bedding or feed for live stock any of the articles mentioned in sections 2 and 3, *except* during the months of July, August, and September, when hay, straw, wheat, oats, shelled corn, cowpeas, shucks, and Spanish moss may be used.

SEC. 8. No person, firm, or corporation, except a duly recognized State or Federal entomologist, shall bring into this State, or have in their possession for any

purpose whatever, any living Mexican cotton boll weevil or cotton boll, square, plant, or seed containing said insect, whether in the adult, egg, larval, or pupal state.

SEC. 9. This commission reserves the right to take such action as it deems best to eradicate or control the Mexican cotton boll weevil, should this pest appear in the State.

SEC. 10. Any person, firm, or corporation, transportation company, or common carrier which shall willfully violate these regulations shall be guilty of a misdemeanor, and on conviction shall be punished according to law. And any shipment made in violation of these regulations is liable to seizure by order of this commission or its agents, and destroyed by them or shipped without the State to the point from which such shipment originated.

NORTH DAKOTA.

[LAW RELATING TO GRASSHOPPERS (1897).]

No. 1705. *Notice, how and when served.* Where the owner of the land on which said board shall have decided plowing must be done for the purposes herein specified cannot with reasonable diligence be served with notice within the State, it shall be sufficient to serve the said notice by publication thereof for two successive issues in the official newspaper nearest said tract.

No. 1706. *Must plow in five days.* If the owner or incumbrancer, if any, shall fail to plow said tract or tracts as ordered and directed by said board of county commissioners within five days after notice as herein provided, then in that event said board of county commissioners shall cause said tract or tracts to be plowed, or so much thereof as may be by them deemed necessary, and audit and pay for said work out of the general fund of said county upon warrant as in other cases made and provided.

No. 1707. *Expense a lien upon land.* Immediately after the said accounts are audited and paid by said county commissioners it shall be the duty of the county auditor to certify to the county treasurer the amount so expended upon each piece and parcel of land, which certificate shall contain the name of the record owner or incumbrancer of said tract, a true description of said land, the amount paid by the county for plowing done thereon, and the county treasurer shall thereupon enter said amount against said land as taxes are entered against land, and the said amount shall constitute a lien upon said land prior to all other incumbrances, and shall bear interest at the rate of seven per cent per annum from date of entry by the county treasurer, and collection thereof may thereafter be made and enforced in the same manner as delinquent taxes are enforced and collected against real property.

No. 1708. *Payment out of general fund.* When the board of county commissioners shall deem the plowing of State land necessary for the purposes herein specified, they shall order the same done, and payment therefor may be made out of the general fund of the county upon warrant as in other cases provided: *Provided, however,* That no growing crops shall be destroyed under the provisions of this article: *Provided further,* That where the board of county commissioners shall deem it necessary to cause plowing upon Government land held by resident claimants, or other means to cause the destruction of grasshoppers and Rocky Mountain locusts, said claimant shall be liable to the county in a civil action for all moneys necessarily expended in carrying out the directions of the board of county commissioners for the purposes herein specified.

OHIO.

SECTION 1. The Ohio State board of agriculture is hereby empowered and directed to make such regulations as may be deemed necessary for the control of dangerously injurious insect pests and plant diseases, and for the prevention of the spread of San Jose scale, peach yellows, black knot, and any other dangerously injurious insect pests or plant diseases, which are hereby declared a public nuisance, and are liable to be transmitted on nursery stock. Said board is hereby authorized to establish a division of nursery and orchard inspection in the Ohio department of agriculture, and to appoint a competent entomologist as the chief inspector of said division, and the necessary assistants, who shall, under the direction of the board have charge of the inspection of nurseries and orchards, as hereinafter provided; he may investigate, or cause to be investigated, outbreaks of dangerously injurious insect pests or plant diseases, and recommend suitable measures to be taken for their eradication or control; he is empowered to devise and test practical remedies for their suppression, and publish the results of these investigations and such other information as may be deemed necessary.

SEC. 2. Every nurseryman or other person in the State of Ohio who is engaged in growing trees, shrubs, plants, and vines for sale, except such as are hereinafter specified, shall on or before the first day of July of each year place on file in the office of the Ohio department of agriculture an application for the inspection of his nursery stock and premises. Failure to file such application, or the disposal of uninspected stock, either by sale or gift, shall render the owner liable to the penalty provided for in section 8 of this act. The chief inspector shall examine, or cause to be examined, before September 15th of each year, or as often as may be deemed necessary by said board, the nurseries and premises of all parties whose applications for inspection have been filed. If upon such examination the nursery stock and premises appear to be free from San Jose scale, peach yellows, black knot, and other dangerously injurious insect pests or plant diseases, a certificate of inspection shall be given to the owner or lessee stating the facts, and said certificate shall be issued before September 15th and shall be valid for one year from that date unless sooner revoked for cause. If any dangerously injurious insect pests or plant diseases are found on nursery stock or premises, the chief inspector shall order and enforce such treatment as shall be deemed sufficient before granting a certificate of inspection. Upon the written request of the owner or lessee of any nursery premises that has been regularly inspected in accordance with the provisions of this section, the said board, through the chief inspector, may issue a certificate of fumigation, provided that all the requirements of the said board have been complied with, and that the said fumigation shall be in accordance with the directions and under the supervision of an authorized assistant inspector appointed by said board. The provisions of this act shall not apply to greenhouse plants and cuttings thereof, bulbs, flowers, and vegetable plants.

SEC. 3. Every agent, dealer or any other person, not engaged in growing trees, shrubs, plants, or vines for sale, who sells or delivers such stock, shall before delivering the same annually place on file in the office of the Ohio department of agriculture a statement made under oath, before an officer qualified to administer oaths in the locality where he may reside, or if a nonresident of the State in the locality where the said stock is sold or delivered, that the said stock has been duly inspected and was received by him accompanied with a valid official certificate of inspection or fumigation. Said statement shall also designate the name of the grower or growers from which such stock was obtained and the name of the owner or owners of the certificate or certificates under

which the same is sold or delivered. The premises of any such person or persons as aforesaid shall be subject to inspection and to such regulations as may be deemed necessary by the Ohio State board of agriculture for the prevention of the spread of dangerously injurious insect pests or plant diseases. Failure to file such sworn statement, or the sale or delivery of such stock after the certificate under which it was bought has become invalid shall render the agent or dealer liable to the penalties prescribed in section 8 of this act. The provisions of this section shall not apply to any person or persons who sell or deliver such stock from nurseries within this State that hold a valid certificate, which is provided for in this act, if the said stock is delivered direct from the nursery to the grower in the original package.

SEC. 4. Whenever a nurseryman, or any other person, shall ship, or deliver, within this State, except for scientific purposes, trees, shrubs, plants, or vines, commonly known as nursery stock, not excepted in section 2 of this act, he shall place upon each carload, box, bale, or other package, a copy of certificate provided for in section 2 of this act, and signed by the chief inspector, stating that the said stock is apparently free from dangerously injurious insect pests and plant diseases. The illegal use of said certificate, by changing, defacing, or placing it on uninspected stock, or using the same after the date of expiration or revocation, shall render the owner or shipper liable to the penalties prescribed for a violation of this act.

SEC. 5. Every package of trees, shrubs, plants, or vines shipped into this State from any other State, Territory, country, or province, shall be plainly labelled on the outside with the names of the consignor and consignee and a certificate stating that the contents have been inspected or fumigated by a State or Government officer, and that the trees, shrubs, plants, or vines therein contained are apparently free from dangerously injurious insect pests and plant diseases. If any trees, shrubs, plants, or vines shall be shipped into this State without such certificate plainly affixed on the outside of the package, box, or car containing the same, the facts must be reported within twenty-four hours to the chief inspector, or a regularly appointed assistant, by the railroad, express, or steamboat company, or by any other person or persons carrying the same, and it shall be unlawful to deliver such property until it has been examined by a regularly appointed inspector, and by him certified to be apparently free from dangerously injurious insect pests and plant diseases. Any agent or common carrier, or persons carrying such property as aforesaid, who shall fail to give such notice as is hereby required, shall be deemed guilty of a violation of this act. When nursery stock is shipped into this State accompanied by a certificate, as herein provided, it shall be held as prima facie evidence of the facts therein stated, but the chief inspector, when he has reason to believe that any such stock is infested or infected, as hereinbefore described, is hereby authorized to cause the same to be examined. In case the same is found to be infested or infected by dangerously injurious insect pests or plant diseases, it shall be seized and the shipper shall be immediately notified, and after ten days from such seizure it may be declared a public nuisance and destroyed.

SEC. 6. Upon the petition of any freeholder or lessee within the State of Ohio, the chief inspector may cause to be examined any trees, shrubs, plants, or vines, either on the premises of said petitioner, or in dangerous proximity thereto, as to the presence of dangerously injurious insect pests or plant diseases, and shall by himself, or through his assistants, have the right, within reasonable hours, to enter upon any premises in the prosecution of the duties defined in this act. If the examination discloses the presence of San Jose scale, peach yellows, black knot, or any other dangerously injurious insect pests or plant diseases, the chief inspector shall notify the owner or lessee of the premises in writing of the facts

by mailing such notice to his usual post-office address. He shall also state the limit of time within which treatment must be applied by the owner or lessee, in accordance with the directions issued by the Ohio State board of agriculture, and specify such trees, shrubs, plants, or vines as must be destroyed, also when they shall be declared a public nuisance, provided the aforesaid orders are not complied with. Should the owner fail to apply the treatment required in said notice in a satisfactory manner, and within the time specified, such treatment may be carried out under the direction of the chief inspector, and the entire cost of such treatment shall be certified to the county auditor of the county in which the property is located, and the same shall become a lien on the premises and shall be collected by the county treasurer as other taxes, and when collected shall be paid to the Ohio State board of agriculture. The owner of any premises as hereinbefore mentioned shall, in addition, be deemed guilty of a violation of this act, by reason of failure to comply with the requirements of said notice and shall be liable to the penalty provided.

SEC. 7. Whenever the chief inspector, or any duly appointed assistant inspector, shall order any trees, shrubs, plants, or vines growing in this State, or any nursery stock that has been shipped in from outside the State, to be destroyed, and the owner shall fail, for ten days after notice of such order, to destroy the same, as directed by such order, such failure shall be deemed a demand on the part of the owner to have judicially determined the right to enforce such destruction, and shall act as a stay upon the proceedings until such judicial determination shall be had; and, in such case, the chief inspector, or any duly appointed assistant inspector, shall commence, without delay, an action in the probate court of the county in which the trees, shrubs, plants, or vines, or nursery stock are located, by filing an affidavit therein, setting forth that the trees, shrubs, plants, or vines, or nursery stock are infested or infected with dangerously injurious insect pests or plant diseases, a description of the premises whereon the same are located, the name of the owner or lessee of such premises, and of all persons having an interest in such premises or trees, shrubs, plants, or vines, and, if the same are nursery stock, the name of the person, firm, or corporation in whose possession the same are found, and that ten days have elapsed since orders have been made for the destruction of the same, and that such orders have not been obeyed. Upon such affidavit being filed the probate judge shall issue a summons for all persons named in such affidavit, which shall contain a copy of said affidavit, commanding them to appear at a time to be fixed therein, not exceeding five days from the date thereof, to answer such complaint; such summons shall be directed to, and served by, the sheriff of the county, and may be served by him in any county in this State, and shall be served and returned, as directed by said probate court. At the time fixed in such summons, if the jury be not waived, said court shall order a jury to be drawn, and such jury shall be drawn, summoned, and impaneled, as in other civil cases in probate courts, and the State of Ohio shall be plaintiff and the persons named in the affidavit shall be defendants, and no pleadings other than such affidavit shall be required, and the issue shall be whether said trees, shrubs, plants, or vines, or nursery stock are infested or infected with dangerously injurious insect pests or plant diseases, and all proceedings shall be had in the trial of such complaint as are provided for the trial of civil cases in probate courts. If the jury shall find that the orders for the destruction of the trees, shrubs, plants, or vines, or nursery stock, shall be obeyed, it shall return a verdict finding the issues with the plaintiff, but if it should fail to so find, it shall return a verdict finding the issues with the defendant, or defendants; and if the issues are found with the plaintiff, the court shall enter judgment against the defendant, or defendants, for costs, and cause execution to be issued there-

for, and shall issue an order to the chief inspector, or assistant inspector, to enforce the orders by him made; but if the issues are found with the defendant, or defendants, the action shall be dismissed and the orders for destruction annulled, and the costs shall be ordered paid by the Ohio State board of agriculture, and paid by it out of any funds appropriated for carrying out this act. In the matter of taxing and apportioning costs, the court shall have the same equity powers as are now conferred upon courts of common pleas.

SEC. 8. Any owner or lessee who shall fail, neglect, or refuse to treat infested or infected trees, shrubs, plants, or vines within the time, and in the manner, prescribed in said notice, and any person who shall be ordered to destroy any trees, shrubs, plants, or vines, or nursery stock, and shall fail, neglect, or refuse to destroy the same, as ordered, within ten days after the probate court shall have issued its order to the chief inspector or assistant inspector, to enforce the orders by him made, and any person who shall fail, neglect, or refuse to comply with, or obey, any order made pursuant to the provisions of this act, or who shall fail, neglect, or refuse to comply with any of the requirements or provisions hereof, or who shall violate or neglect to carry out, or offer any hindrance to the carrying out of any of the provisions of this act, shall be adjudged guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than ten dollars or more than one hundred dollars for the first offense; and not less than fifty dollars or more than three hundred dollars for any subsequent offense, and the cost of prosecution, and stand committed until the same are paid. It shall be the duty of the prosecuting attorney of the county to conduct all prosecutions under this act, and all fines recovered shall be paid to the Ohio State board of agriculture. The probate court of each county in this State shall have original and final jurisdiction in all the prosecutions under any of the provisions of this act, and, for the trial of the same, such courts shall always be open regardless of the terms fixed in said courts for the trial of criminal cases, and the complainant shall not be required to give security for costs.

SEC. 9. The Ohio State board of agriculture shall make an annual report to the governor of the State concerning the operations of the division of nursery and orchard inspection, which shall give the number of nurseries inspected, the number of certificates issued, the number of trees treated and destroyed by the direction of the chief inspector, and such other information as may be deemed necessary.

SEC. 10. Said act passed May 10, 1902, entitled "An act to amend an act passed April 14, 1900, entitled 'An act to prevent the introduction and spread of the San Jose scale and other dangerous insects and dangerously contagious diseases affecting trees, shrubs, vines, plants, and fruits,'" is hereby repealed; and that this act shall take effect and be in force from and after its passage.

REGULATIONS OF THE OHIO DEPARTMENT OF AGRICULTURE CONCERNING THE INSPECTION, CERTIFICATION, AND FUMIGATION OF NURSERY STOCK.

In compliance with the nursery and orchard inspection law of Ohio, all applications for nursery inspection must be placed on file in this office on or before July 1 of each year.

As the law exempts "greenhouse plants and cuttings thereof, bulbs, flowers, and vegetable plants" from inspection, no certificates on stock of this character will be issued unless the cost of inspection is paid by the owner.

Certificates of inspection will not be issued covering the stock or the premises upon which nursery stock is grown, if any of the insect pests or plant diseases named in the above-mentioned act are found to be present thereon, until all infested or infected trees, shrubs, plants, and vines have been treated as prescribed by the division of nursery and orchard inspection of the Ohio department of agriculture. If San Jose scale or peach yellows are found, the affected trees, shrubs, plants, and vines must be destroyed, and, as an additional precaution, if San Jose scale is found in the nursery or in dangerous proximity thereto, fumigation of the stock will be required. Said fumigation will be conducted under the direction of an assistant inspector.

After certificates of inspection have been granted should any trees, shrubs, plants, or vines be found to be infected by crown gall or other dangerous plant disease or diseases, or infested with insects affecting the roots, the same must be burned by the nurserymen, and failure to comply with this regulation may be deemed sufficient cause for the revocation of said certificates.

Applications for certificates of fumigation must be made on special blanks, which will be furnished on request. Such certificates will be granted after the regular nursery inspection has been made and the requirements of the division of nursery and orchard inspection have been complied with, and in all cases the stock will be fumigated under the immediate supervision of an assistant inspector, as is required by law.

All potassium cyanide for fumigating purposes will be furnished through this office at cost, put up in charges ready for use. Fumigating houses should be thoroughly repaired before the inspection is made.

For the convenience of nurserymen doing business in other States, duplicate certificates will be issued on request and sent to the official inspectors in the States where such are required to be filed.

Nurserymen and growers are cautioned to allow no stock to be sent out from their grounds unless accompanied with copies of their certificates for the current year, as provided by law.

OKLAHOMA.

AN ACT relating to insects and diseases which are injurious to growing crops, nursery stock, fruit or shade trees, bushes, shrubbery and vines, grains, fruits, and vegetables, providing for the establishment and maintenance of quarantine regulations for the purpose of preventing the introduction and dissemination of same, for the inspection of nurseries and the regulation of nursery agents, prescribing penalties for the violation of such provisions, and for other purposes.

Be it enacted by the legislative assembly of the Territory of Oklahoma:

SECTION 1. That it shall be unlawful for any person, firm, or corporation to sell or offer to sell any nursery stock, fruit trees, bushes, or vines or any fruits, grains, seeds, or vegetables, for the purpose of planting or otherwise, if the same are infested with injurious insects or infected with contagious plant diseases.

SEC. 2. It shall be the duty of the board of agriculture to prevent the introduction and dissemination of injurious insect pests and contagious plant diseases, whether said injurious insects or plant diseases are known to exist in this Territory or elsewhere, and for this purpose the board of agriculture is hereby authorized and empowered to establish, maintain, and enforce such quarantine rules and regulations as may be deemed necessary to prevent the importation or exportation of diseased or infested nursery stock, fruits, grains, seeds, or vegetables.

SEC. 3. When the said board of agriculture shall have formulated and adopted

the quarantine rules and regulations as provided in section two (2) of this act the governor of the Territory of Oklahoma, when advised and requested by the said board of agriculture, shall issue a proclamation setting forth and proclaiming the orders, rules, and regulations so prescribed by said board of agriculture and declaring the same to be in force and in effect, and the issuance of said proclamation shall be due and public notice of its provisions, and no further notice or publication of the same shall be necessary.

SEC. 4. Each nursery located in the Territory of Oklahoma in which fruit or shade trees, bushes and vines, or ornamental shrubbery are grown for sale, shall, at least once each year during the growing season, be subject to inspection by a competent entomologist acting under the direction of the board of agriculture, and if it shall appear from the report of the said entomologist that such nursery stock is free from infestation by injurious insect pests and from infection by contagious plant diseases the said board of agriculture shall issue to the person or persons owning or operating such nursery a certificate to that effect. If it shall appear from the report of said entomologist that, upon careful examination, such nursery stock has been found to be infested with injurious insect pests or infected with contagious plant diseases, it shall be the duty of the said board of agriculture to prohibit the sale or planting such nursery stock in the Territory of Oklahoma until said nursery stock shall have been properly dipped, fumigated, sprayed, or otherwise disinfected as directed by said board of agriculture. It shall furthermore be the duty of the board of agriculture to require the owner or owners of each nursery located in Oklahoma to send out a copy of said certificate with each shipment of nursery stock which has been sold to be planted in Oklahoma: *Provided*, That there shall be paid by the owner or operator of such nursery a fee as hereinafter provided, together with necessary traveling expenses incurred in making such inspection: *Provided further*, That the entomologist or assistant entomologist of the Oklahoma agricultural experiment station shall be detailed for service as inspector of nurseries when not inconsistent with the performance of his regular duties.

SEC. 5. The importation, transportation, and sale of fruits, grains, seeds, or vegetables which may be infested with injurious insect pests or infected with contagious plant diseases or containing seeds of any noxious or injurious plants shall be subject to such quarantine regulations as may be prescribed and established by the board of agriculture, acting under the authority and power granted in sections two (2) and three (3) of this act.

SEC. 6. Any person, firm, or corporation which owns or operates a nursery in any other State or Territory, and which desires to sell from the same, either directly or indirectly, or by agent, any trees, vines, bushes, or other nursery stock within the limits of the Territory of Oklahoma, shall first procure a permit from the board of agriculture authorizing such nursery, or its duly constituted representatives, to do business in the Territory. As conditions precedent to the issuance of such permit the board of agriculture shall require a certificate of inspection from a competent entomologist, duly authorized to act as an inspector in the State or Territory where such nursery is owned and operated, and the board of agriculture may, furthermore, require such references and evidences of integrity as may seem to be necessary to establish the responsibility and good faith of the applicant.

SEC. 7. The board of agriculture shall be and hereby is duly authorized to require that any or all nursery stock which is shipped into Oklahoma from any other State or Territory shall be accompanied by a duplicate of certificate of nursery inspection which may be required by law in such State or Territory,

and said board of agriculture may furthermore require that any or all nursery stock shipped in from any other State or Territory shall be subject to reinspection; and if upon such reinspection it shall be found that such nursery stock is infested with injurious insect pests or infected with contagious plant diseases, it shall be the duty of said board of agriculture to prohibit the sale, delivery, or planting of such nursery stock within the limits of the Territory of Oklahoma until the same shall have been dipped, fumigated, sprayed, or otherwise disinfected as directed by said board of agriculture; and it shall be unlawful for any nursery agent or the agent of any common carrier to deliver any nursery stock which may have been shipped in from any other State or Territory until the same shall have been inspected or released as directed by said board or its duly authorized inspectors at the discretion of said board.

SEC. 8. Any person who, acting as agent or solicitor within the limits of the Territory of Oklahoma, sells, or offers to sell, trees or any other nursery stock for any person, firm, or corporation which may be engaged in the nursery business shall be required to carry a letter or certificate from his principal, setting forth the fact that he is duly authorized to represent such nursery and that a guarantee is made that any written contract entered into by him as agent will be fulfilled if the same is accepted by said nursery and unless notification to the contrary be made in writing to the purchaser within thirty days after such order or contract is made. In addition to the foregoing, each agent or solicitor who sells or offers to sell trees or other nursery stock that may have been grown in any other State or Territory shall be required to procure and carry a duplicate of the permit issued to his principal.

SEC. 9. It shall be unlawful to wilfully misrepresent nursery stock which is offered for sale or refuse to state where the same was propagated or the manner of propagation, or to sell, offer for sale, or deliver nursery stock which is untrue to name, or to sell seeds which have been adulterated or seeds which by reason of age have become deficient in vitality and germinating power, or containing seeds of any noxious or injurious plants.

SEC. 10. The violation of the provisions of any of the foregoing sections of this act shall be deemed a misdemeanor, punishable by fine of not less than fifty dollars nor more than three hundred dollars and in addition any person, firm, or corporation engaged in the nursery business or any nursery agent or solicitor who violates the provisions of section nine (9) of this act shall forfeit the right to do business in the territory which may be held by such party or parties and such agent or solicitor shall be disqualified to receive a permit to act as agent for any other nursery which operates in the territory.

SEC. 11. The board of agriculture shall collect as a fee for issuing a permit to nurseries to do business in the Territory, as provided in section six (6) of this act, the sum of five dollars and, as a fee for each agent's duplicate of such permit, the further sum of one dollar. It shall be the duty of the board of agriculture to regulate the amount of nursery inspection fees, and the fees for reinspection of the nursery stock that is shipped in from any other State or Territory, apportion traveling expenses of inspector and collect the same before issuing certificates of inspection. All moneys so received shall be paid over to the treasurer of the said board, to be placed in separate fund, which shall be known as the inspection fund, to be used at the discretion of said board, and said board shall render an annual report to the governor, giving a detailed statement of all receipts and expenditures under the provisions of this section.

SEC. 12. All acts and parts of acts in conflict with this act are hereby repealed.

SEC. 13. This act shall take effect and be in force from and after May 1st, 1905.

Approved March 13, 1905.

RULES AND REGULATIONS CONCERNING NURSERY STOCK.

The following insects and fungus diseases are considered injurious and are hereby declared to constitute infestation or infection when found on trees, plants, or other nursery stock or seeds:

1. San Jose scale (*Aspidiotus perniciosus*).
2. The new peach scale (*Diaspis amygdali*).

When found in a nursery all infested stock to be burned.

If San Jose scale is found in the immediate neighborhood, all stock must be fumigated or certificate will be withheld.

3. Black knot (*Plowrightia morbosa*).
4. Crown gall (*Dendrophagus globosus*).

When found in a nursery all diseased stock to be destroyed, otherwise stock may not be shipped.

5. Peach yellows.
6. Peach and plum rosette.

All infested trees and nursery stock to be destroyed.

7. Wooly aphis (*Schizoneura lanigera*).

All badly diseased stock to be destroyed; other stock to be fumigated or treated with kerosene emulsion as directed.

8. Peach tree borer.

9. The Mexican cotton boll weevil (*Anthonomus grandis*).

RULE 1. All nursery stock shipped into this Territory from any other State or Territory shall be plainly labeled or tagged with a copy of the certificate of inspection, signed by the State entomologist or duly authorized official of the State or Territory in which such nursery stock shall have been grown, duly certified over the fac simile signature of the secretary of the board of agriculture. All consignments of nursery stock not so labeled or tagged shall be liable to seizure and confiscation by the duly authorized entomologist or inspector of the board of agriculture.

RULE 2. The inspector and his assistants shall have authority to inspect any shipment of nursery stock at any station in this Territory, and shall have authority to stop any nursery stock when in transit, for the purpose of inspecting the same, regardless of whether such stock shall bear a certificate of inspection or not. The inspector shall have authority to seize, condemn, and destroy any nursery stock infested with San Jose scale or other seriously injurious insect or disease found within the confines of this Territory.

RULE 3. Each and every person, firm, or corporation growing nursery stock for sale in this Territory shall apply to the secretary of the board of agriculture for inspection on or before June 1st of each year. It shall be the duty of the secretary to cause inspection of such nursery not later than September 1st. If upon such inspection the nursery stock and premises be found apparently free from San José scale and other seriously injurious insects and plant diseases, a certificate shall be given to that effect. On and after July 1st, 1905, a copy of said certificate, bearing the facsimile signature of the secretary, shall be attached to each and every box, bundle, and package of nursery stock shipped within this Territory. Shipments of nursery stock not so labeled shall be refused if found in transit or in the possession of any common carrier by the entomologist or his assistants, shall be liable to confiscation and destruction.

RULE 4. Transportation companies and their agents shall immediately notify the secretary of the board of agriculture (Guthrie, Oklahoma) when, by oversight, negligence, or otherwise, any shipment of nursery stock without a proper certificate attached shall arrive at any station in this Territory, and it shall

be the duty of the secretary to proceed as speedily as possible, by himself or a duly authorized inspector, to investigate and dispose of such shipment.

RULE 5. The inspector of the board of agriculture shall have power to require any nurseryman in the Territory to fumigate his trees, shrubs, or plants with hydrocyanic acid gas or other substance when, in his judgment, such treatment is necessary or advisable for the proper protection of the agricultural or horticultural interests of the Territory or any section thereof.

RULE 6. In addition to fruit trees the following shall be classed as nursery stock if offered for sale and shall be subject to the regulations governing the inspection and transportation of the same: Strawberry plants, vines, ornamental trees and shrubs, and field-grown roses.

RULE 7. All nursery stock grown in States or Territories where there is no nursery-inspection law shall be inspected by the entomologist of the board of agriculture before the same can be delivered to the consignee.

RULE 8. All fees for inspection shall be determined upon a basis of the actual cost of the same.

RULE 9. Tags or labels for use as prescribed in rules 1 and 3 may be procured from the secretary of the board of agriculture at actual cost, the prices being as follows, to wit: Seventy-five cents for the first hundred and 30 cents for each additional hundred, postpaid, or, in larger lots, by express at purchaser's expense, per 500, \$1.75; per 1,000, \$2.50; cash to accompany order in all cases.

RULES AND REGULATIONS CONCERNING COTTON SEED.

RULE 1. For the purpose of preventing the introduction of the Mexican cotton boll weevil into the Territory of Oklahoma from the State of Texas, where the same is now known to exist, a rigid quarantine is hereby declared against the following counties in the State of Texas, to wit, Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bell, Bexar, Blanco, Bosque, Bowie, Brazos, Brazoria, Brown, Burleson, Burnet, Caldwell, Calhoun, Cameron, Camp, Cass, Chambers, Cherokee, Collin, Colorado, Comal, Comanche, Cooke, Coryell, Dallas, Delta, Denton, Dewitt, Duval, Eastland, Ellis, Erath, Falls, Fannin, Fayette, Fort Bend, Franklin, Freestone, Galveston, Gillespie, Goliad, Gonzales, Grayson, Gregg, Grimes, Guadalupe, Hamilton, Hardin, Harris, Harrison, Hays, Henderson, Hidalgo, Hill, Hood, Hopkins, Houston, Hunt, Jack, Jackson, Jasper, Jefferson, Johnson, Karnes, Kaufman, Kent, Lamar, Lampasas, Lavaca, Lee, Leon, Liberty, Limestone, Live Oak, Llano, Madison, Matagorda, Marion, McLennan, McMullen, Milam, Mills, Montgomery, Morris, Nacogdoches, Navarro, Nueces, Newton, Orange, Palo Pinto, Panola, Parker, Polk, Rains, Red River, Refugio, Robertson, Rockwell, Rusk, Sabine, San Augustine, San Jacinto, San Patricio, San Saba, Shelby, Smith, Somervell, Starr, Stephens, Tarrant, Titus, Travis, Trinity, Tyler, Upshur, Van Zandt, Victoria, Waller, Walker, Washington, Wharton, Williamson, Wilson, Wise, Wood, and also against the following parishes in Louisiana, Sabine, Vernon, Calcasieu, and De Soto, as well as against all other counties of Texas or parishes of Louisiana where the said Mexican boll weevil may be known to exist; and in order to prevent the introduction into the Territory of Oklahoma of the said Mexican boll weevil it is hereby declared:

RULE 2. That no cotton seed, cotton-seed hulls, seed cotton, and cotton-seed sacks (which have been used), cotton pickers' sacks, corn in the shuck, unsacked corn, unsacked oats, unsacked wheat, unsacked oats, and unsacked cowpeas shall

at any time be brought into the Territory of Oklahoma from the infested counties of Texas or parishes of Louisiana.

RULE 3. That the following commodities are not restricted at any time, provided no quarantined articles are used in packing: Fruit, truck, rice, and rice-grain products.

RULE 4. That all shipments of household goods from infested areas shall be prohibited, unless accompanied by an affidavit, attached to the waybill, to the effect that the shipment contains no cotton, cotton seed, seed cotton, cotton-seed hulls, and cotton-seed sacks, cotton-pickers' sacks, corn in the shuck, hay, straw, or loose Spanish moss, either as packing or in any other way, unless the shipment be made during the months of July, August, and September, when hay, straw, corn shucks, or Spanish moss may be used for packing. Such shipments may, however, be subject to inspection at the discretion of the entomologist of the board of agriculture.

RULE 5. That through shipments of quarantined articles shall be made in tightly closed box cars and shall not be unloaded while in transit through the Territory.

RULE 6. That shipments of baled cotton into Oklahoma shall be made in tightly closed box cars.

RULE 7. That no common carrier shall use for bedding or feed for live stock any of the quarantined articles, except during July, August, and September, when hay, straw, Spanish moss, or corn shucks may be used.

RULE 8. That the quarantine hereby declared may from time to time be extended so as to include other counties of the State of Texas or parishes of Louisiana.

RULE 9. That no person or persons, except a duly recognized entomologist, shall bring or cause to be brought into the Territory, by mail, express, or otherwise, any living specimens of the Mexican cotton boll weevil in any of its forms of development or egg state.

RULE 10. All railroads, express companies, and other companies and other common carriers, and all private vehicles, etc., entering the Territory of Oklahoma from the States of Texas or Louisiana, or passing through the Territory of Oklahoma from any of the infested districts of the State of Texas or Louisiana are especially enjoined to comply with the requirements of this order and of the laws of the Territory of Oklahoma governing the same.

OREGON.

LAWS OF 1899.

AN ACT to amend an act entitled "An act to create a State board of horticulture and appropriate money therefor, approved February 25, 1889, and an act amendatory thereof, entitled 'An act to amend an act entitled an act to create a State board of horticulture and appropriate money therefor,' approved February 25, 1889, approved February 21, 1891, and to protect the horticultural industry in Oregon, and an act amendatory thereof, entitled an act to amend an act entitled 'An act to create a State board of horticulture and appropriate money therefor,' approved February 25, 1889, and an act amendatory thereof, entitled an act to amend an act entitled 'An act to create a State board of horticulture and appropriate money therefor, approved February 25, 1889,' approved February 21, 1891, and to protect the horticultural industry in Oregon," approved February 23, 1895.

Be it enacted by the legislative assembly of the State of Oregon:

* * * * *

SEC. 2. The members shall reside in the districts for which they are respectively appointed. They shall be selected with reference to their knowledge of

and practical experience in horticulture and the industries connected therewith, and shall be engaged in practical horticulture during their incumbency of the office of commissioner. They shall hold office for the term of four years, and until their successors are appointed and have qualified, unless removed by the appointing board for failure to perform their duties. It shall be the duty of the president to visit at least once a year every district, and examine the orchards, nurseries, and work of the district commissioners, and ascertain whether or not the law and regulations of the board are being properly executed. He must personally inspect most of the orchards during the fruit-growing season, see that the regulations of the board regarding spraying are being faithfully executed wherever insects, pests, or disease injurious to tree or fruit are to be found. He must visit the principal fruit-shipping points during the shipping season, inspect the fruit shipped, and prevent the shipment of insect and pest infested fruit. He shall give notice through the public press one week in advance of his visit to each county, giving the time and place of his visit, where he shall receive complaints of fruit growers, and distribute to them printed and oral instructions regarding destruction of pests, and other information, including proper methods of handling, packing, and shipping fruits. It shall also be his duty to visit, when possible, if requested by an association or a number of fruit growers, the meetings of such associations of fruit growers, and aid them in the organization of proper associations beneficial to the growing and marketing of fruits. The president shall preside at all meetings of the board, and may call special meetings whenever an emergency may require it. He shall make an annual report to the appointing board of the general condition of the fruit interests of the State and success of the commissioners in the work of exterminating pests and executing the law.

SEC. 15. Inasmuch as the provisions of this act are of immediate importance to the horticultural interests of this State, this law shall take effect from and after its approval by the governor.

Approved February 17, 1899.

AN ACT to protect the fruit and hop industry of Oregon.

Be it enacted by the legislative assembly of the State of Oregon:

SECTION 1. It shall hereafter be unlawful for any person, firm, or corporation, owning or operating any nursery, fruit orchard of any kind, hopyards, flower gardens, or ornamental trees to throw any cuttings or prunings from any fruit trees, nursery stock, ornamental trees, or hop vines into any public road, highway, lane, field, or other inclosure, or into any water course of any kind; but shall destroy such cuttings or prunings with fire within thirty days from the time such cuttings or prunings are made.

SEC. 2. It shall hereafter be the duty of any person, firm, or corporation owning or operating any such nursery, fruit orchard, hopyard, flower garden, or ornamental trees, and knowing such to be infected with any kind of insects, pests, or disease, to immediately spray or destroy the same in such manner as the fruit commissioner for his district may direct.

SEC. 3. It shall be unlawful for any person, firm, or corporation doing business in the State of Oregon to sell Paris green, arsenic, London purple, sulphur, or any spray material or compound for spraying purposes in quantities exceeding one pound without providing with each package sold a certificate, duly signed by the seller thereof, guaranteeing the quality and per cent of purity of said materials.

SEC. 4. Any person, firm, or corporation selling any of the above materials which do not conform with the certificate furnished therewith shall be deemed

guilty of a misdemeanor, and upon conviction thereof shall be subject to a fine of not less than twenty-five (\$25) dollars nor more than one hundred (\$100) dollars.

SEC. 5. It shall be unlawful for any person, firm, or corporation to import or sell any infested or diseased fruit of any kind in the State of Oregon.

SEC. 6. Every person who packs or prepares for shipment to any point without the State, or who delivers or causes to be delivered to any express agent or railroad agent or other person, or to any transportation company or corporation for shipment to any point without the State any fruit or fruits, either fresh, cured, or dried, that is infected with insects, pests, or diseases injurious to trees, shrubs, plants, fruits, or vegetables is guilty of a misdemeanor.

SEC. 7. Any person, firm, or corporation violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than twenty-five (\$25) dollars nor more than one hundred (\$100) dollars.

SEC. 8. It shall be the duty of the commissioner of the State board of horticulture of the district in which a violation of this act occurs to present the evidence of the case to the district attorney, whose duty it shall be to prosecute any person guilty of a violation of this act, which prosecution may be brought in any of the justice courts of this State.

SEC. 9. Inasmuch as the horticultural interests of this State demand immediate attention, this act shall be in full force and effect from and after its approval by the governor.

Approved ———.

QUARANTINE REGULATIONS.

RULE 1. All consignees, agents, or other persons shall, within twenty-four hours, notify the quarantine officer of the State board of horticulture, or a duly commissioned quarantine guardian, of the arrival of any trees, plants, buds, or scions at the quarantine station in the district of final destination.

RULE 2. All trees, plants, cuttings, grafts, buds, or scions imported or brought into the State from any foreign country, or from any of the States or Territories, are hereby required to be inspected upon arrival at the quarantine station in the district of final destination; and if such nursery stock, trees, plants, cuttings, grafts, buds, or scions are found to be free of insect pests and fungous diseases, the said quarantine officer or duly commissioned quarantine guardian shall issue a certificate to that effect; and, furthermore, if any of said trees, plants, cuttings, grafts, buds, or scions are found infested with insect pests, fungi, blight, or other diseases injurious to fruit or to fruit trees, or other trees or plants, they shall be disinfected and remain in quarantine until the quarantine officer of the State board of horticulture or the duly commissioned quarantine guardian can determine whether the said trees, plants, cuttings, grafts, buds, or scions are free from live injurious insect pests, or their eggs, larvæ, or pupæ, or fungous diseases, before they can be offered for sale, gift, distribution, or transportation. All persons or companies are hereby prohibited from carrying any trees, plants, cuttings, grafts, buds, or scions from without the State to any point within the State beyond the nearest point on its line or course to the quarantine station in the district of ultimate destination, or from any point within the State to any point therein, until such trees, plants, cuttings, grafts, buds, or scions have been duly inspected, and, if required, disinfected as hereinbefore provided; and all such shipments must be accompanied by the proper certificate of the inspecting officer: *Provided, however,* That after such

persons or company have given the proper officer four days' notice, he or they shall not be required to hold such shipments further without directions from such officer.

RULE 3. All peach, nectarine, apricot, plum, or almond trees, and all other trees budded or grafted upon peach stocks or roots, all peach or other pits, and all peach, nectarine, apricot, plum, or almond cuttings, buds, or scions, raised or grown in a district where the "peach yellows" or the "peach rosette" are known to exist, are hereby prohibited from being imported into or planted or offered for sale, gift, or distribution within the State of Oregon.

RULE 4. All trees, plants, cuttings, grafts, buds, scions, seeds, or pits arriving from any foreign country found infested with insect pests or their eggs, larvæ, or pupæ, or with fungi, or other disease or diseases hitherto unknown in this State, are hereby prohibited from landing.

RULE 5. Fruit of any kind grown in any foreign country, or in any of the States or Territories, found infested with any insect or insects, or with any fungi, blight, or other disease or diseases injurious to fruit or fruit trees, or to other trees or plants, is hereby prohibited from being offered for sale, gift, or distribution within the State.

RULE 6. Any boxes, packages, packing material, and the like infested with insect or insects, or their eggs, larvæ, or pupæ, or by any fungi, blight, or other disease or diseases known to be injurious to fruit or to fruit trees, or to other trees or plants, and liable to spread contagion, are hereby prohibited from being offered for sale, gift, distribution, or transportation until said material has been disinfected by dipping it in boiling water and allowing it to remain in said boiling water not less than two minutes; such boiling water used as such disinfectant to contain, in solution, one pound of concentrated potash to each and every ten gallons of water.

RULE 7. All trees, plants, grafts, cuttings, buds, or scions may be disinfected by dipping in a solution of three-fourths of a pound of whale-oil soap (eighty per cent) to each and every gallon of water; said whale-oil soap solution shall be kept at a temperature of 100 to 150 degrees. Said trees, plants, cuttings, grafts, buds, or scions shall remain in said solution not less than two minutes. After said trees, plants, cuttings, grafts, buds, or scions have been disinfected, they shall remain in quarantine fourteen days, unless otherwise directed by the inspecting officer, for subsequent inspection, and if deemed necessary by the quarantine officer of the State board of horticulture, or a duly commissioned quarantine guardian, for further disinfection.

RULE 8. All trees, plants, cuttings, grafts, buds, or scions may be disinfected by fumigation with hydrocyanic acid gas, as follows: Said trees, plants, cuttings, grafts, buds, or scions shall be covered with an air-tight tent or box, and for each and every 100 cubic feet of space therein one ounce of (C. P.) cyanide of potassium (ninety-eight per cent), one fluid ounce of sulphuric acid, and two fluid ounces of water shall be used. The cyanide of potassium shall be placed in an earthenware vessel, the water poured over the said cyanide of potassium, afterward adding the sulphuric acid, and the tent or box to be immediately closed tightly and allowed to remain closed for not less than forty minutes. After said trees, plants, cuttings, grafts, or scions have been treated with hydrocyanic acid gas as above directed, they shall remain in quarantine for fourteen days, unless otherwise directed by the inspecting officer, for subsequent inspection, and if deemed necessary by a member of the State board of horticulture, or the quarantine officer of said board, or a duly commissioned quarantine guardian, for subsequent disinfection.

RULE 9. All trees, plants, cuttings, grafts, buds, or scions imported or brought

into the State shall be inspected upon arrival at the quarantine station in the district of final destination, and if found infested with any injurious insects or diseases which can not be destroyed by the remedies required in rules 7 and 8 of these regulations, are hereby prohibited from being planted or offered for sale, gift, or distribution and shall be proceeded against as a nuisance.

RULE 10. If any person or persons having in their possession trees, plants, cuttings, grafts, buds, scions, seeds, or pits infested with an insect or insects, or with any fungi, blight, or other disease or diseases injurious to fruit trees, or to any other trees or plants, shall refuse or neglect to disinfect the said trees, plants, cuttings, grafts, buds, scions, seeds, or pits, as is required by rules 7 and 8 of these regulations, after having been notified to do so by a member of the State board of horticulture, the quarantine officer of said board, or a duly commissioned quarantine guardian, the said trees, plants, cuttings, grafts, buds, scions, seeds, or pits shall be declared a public nuisance and shall be proceeded against as provided by law.

RULE 11. Animals known as flying fox, Australian or English wild rabbits, or other animals or birds detrimental to fruit or fruit trees, plants, etc., are prohibited from being brought or landed in this State, and, if landed, shall be destroyed.

RULE 12. Quarantine stations: For the first district, comprising the counties of Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop, and Tillamook, shall be Portland. W. K. Newell, quarantine officer, or any member of the board or the secretary thereof. For the second district, comprising the counties of Marion, Polk, Benton, Linn, Lincoln, and Lane, shall be Salem. L. T. Reynolds, quarantine officer, or any member of the board or the secretary thereof. For the third district, comprising the counties of Josephine, Coos, Curry, Douglas, Jackson, Lake, and Klamath, shall be Ashland. A. H. Carson, quarantine officer, or any member of the board or the secretary thereof. For the fourth district, comprising the counties of Morrow, Wasco, Gilliam, Crook, and Sherman, shall be The Dalles. Emile Schanno, quarantine officer, or any member of the board or the secretary thereof. For the fifth district, comprising the counties of Umatilla, Union, Baker, Wallowa, Malheur, Grant, and Harney, shall be Milton and Pendleton. Judd Geer, quarantine officer, or any member of the board or the secretary thereof. At all stations such other quarantine officers as may be from time to time appointed by the board, notice whereof will be given, and complete lists of whom may be obtained from the secretary or any member of the board.

RULE 13. Importers or owners of nursery stock, trees or cuttings, grafts, buds, or scions, desiring to have such nursery stock, trees, plants, cuttings, grafts, buds, or scions inspected at points other than regular quarantine stations, may have such inspection done where required: *Provided, however,* That such importers shall pay all charges of inspection; such charges and expenses to be paid before a certificate is granted. Transportation companies or persons and consignees or agents shall deliver and cause to be detained all nursery stock, trees, plants, and fruit at one or the other of the quarantine stations, for inspection, as provided by the rules and regulations of the board.

RULE 14. The fee for the inspection of apple, pear, plum, peach, nectarine, prune, cherry, apricot, nut-bearing trees, and all other trees, shrubs, or plants, shall be as follows: Thirty cents per hour, including the time from leaving home, inspection, and return home of the inspector, and actual traveling and other expenses. On all fruits the fee for inspection shall be \$1.00 on any sum up to \$35.00, and \$2.00 on any sum over that amount, and \$5.00 for carload lots.

RULE 15. All persons growing nursery stock, trees, and plants for sale, or to

be offered for sale, are hereby required to report to the commissioner of the district in which said nursery stock, trees, or plants are grown, for inspection during the months of September, October, or November of each and every year; and the commissioner of such district, or his duly appointed deputy, shall inspect such nursery stock, trees, or plants prior to shipment and delivery. When said nursery stock, trees, or plants are found by said inspecting officer to be worthy of a certificate, setting forth the freedom of such nursery stock, trees, or plants from live, injurious insect pests, their eggs, larvæ, pupæ, or fungous disease, the said inspecting officer shall then issue to the owner or owners of said nursery stock, trees, or plants a certificate of inspection. The condition under which this certificate is granted is, that the party or parties receiving such certificate shall be compelled to disinfect by fumigation with hydrocyanic-acid gas, as described in rule 8, all pear and apple trees, or other stock grown on apple roots, after lifting the same and before delivery to purchaser or carriers; and, in case such fumigation is neglected, said certificate of inspection shall be void and of no effect.

Passed at a meeting of the State board of horticulture at Portland, Oregon, April 3, 1895, and amended at a regular meeting of the State board of horticulture at Salem, Oregon, October 15, A. D. 1895.

LAW OF 1905.

AN ACT to provide for the appointment of county fruit inspectors and to amend sections 4178 and 4185 of the Codes and Statutes of Oregon as compiled and annotated by Charles B. Bellinger and William W. Cotton.

Be it enacted by the people of the State of Oregon:

SECTION 1. That upon a petition of not less than twenty-five residents and fruit growers of any county in this State the county court of said county shall appoint a county inspector whose duty it shall be to inspect the apple and other fruit orchards of said county and to enforce the laws now in force and that may be hereafter in force in this State applicable to the fruit industry and to the growing, handling, and selling of fruit, fruit trees, and other nursery stock: *Provided*, That the inspector so to be appointed shall be recommended and certified to be competent for such position by the State district commissioner of the State board of horticulture for the said county, and said county inspector shall hold his office during the pleasure of said county court.

SEC. 2. It shall be the duty of the State district commissioner to instruct and educate the county inspectors as to the laws and quarantine regulations of this State and the rules and regulations of the State board of horticulture.

The county inspector shall perform his duties under the general supervisions of the State district commissioner for said county, to whom he shall make reports in the manner prescribed by the State board of horticulture.

SEC. 3. Such county inspector shall be paid for his services by the said county a sum not exceeding \$3 per day and pay his own personal expenses for each and every day actually employed in the performance of his duties as herein provided, and the said county inspector shall report monthly to the said State district commissioner the time for which he is entitled to pay during the month next preceding and the said State district commissioner shall certify the same to the county court before such compensation shall be paid to said county inspector.

SEC. 4. If any county for any reason fails to appoint a county inspector as herein provided, then the inspector of any adjacent county may perform such

services, and his compensation and the necessary expenses incurred in the performance of his duty shall be charged against the county where the service is performed, as if he had been appointed by the county court of said county.

SEC. 5. The State district commissioner of horticulture shall hear and promptly decide all appeals from the county inspectors in his district, and his decision shall have full force and effect until set aside by the courts of the State.

All appeals from county inspectors to the district commissioners shall be under the form and regulations as prescribed by the State board of horticulture.

SEC. 6. That section 4178 of the Codes and Statutes of Oregon, as compiled and annotated by C. B. Bellinger and William W. Cotton, be, and the same is hereby, amended to read as follows :

SEC. 4178. Said board shall employ without their number a secretary, who shall exercise the powers and discharge the duties conferred upon him by this act, and whose compensation shall not exceed \$100 per month, to be paid in the same manner as other State officers. Said board shall also elect from their own number a treasurer. Before entering upon the discharge of his duties each member of the board shall make and subscribe an oath to support the Constitution of the United States and of the State of Oregon, and to diligently, faithfully, and impartially discharge the duties of his office, which said oaths shall be filed with the secretary. The secretary shall make and subscribe a like oath, which shall be filed with the treasurer of the board.

SEC. 7. That section 4185 of the Codes and Statutes of Oregon, as compiled and annotated by C. B. Bellinger and William W. Cotton, be and the same is hereby amended to read as follows :

SEC. 4185. It shall be the duty of the several members of the board and of the secretary or the county inspectors under their direction, whenever they shall deem it necessary, to cause an inspection to be made of any orchards, nurseries, trees, plants, vegetables, vines, or any fruit-packing house, storeroom, salesroom, or any other place within their districts, and, if found infested with any pests, disease, or fungous growth injurious to fruits, plants, vegetables, trees, or vines, or with their eggs or larvæ, liable to spread to other places or localities, or of such nature as to be a public danger, they shall notify the owner or owners, or persons in charge of or in possession of such articles, things, or places, that the same are so infested, and shall require said persons to eradicate or destroy said insects or pests or their eggs or larvæ or to treat such contagious diseases within a certain time to be specified in said notice. Said notices may be served upon the person or persons, or any of them, owning, having charge, or having possession of such infested place, article, or thing, by any member of the board or by the secretary thereof or by any person deputed by the said board for that purpose, or they may be served in the same manner as a summons in an action at law. Such notice shall contain directions for the application of some treatment approved by the commissioners for the eradication or destruction of said pests or the eggs or larvæ thereof, or the treatment of contagious diseases or fungous growths. Any and all such places, orchards, nurseries, trees, plants, shrubs, vegetables, vines, fruit, or articles thus infested are hereby declared to be a public nuisance; and whenever any such nuisance shall exist at any place in the State on the property of any owner or owners upon whom or upon the person in charge or possession of whose property notice has been served as aforesaid, and who shall have failed or refused to abate the same within the time specified in such notice, or in the property of any non-resident or any property not in the possession of any person and the owner or owners of which can not be found by the resident member of the board or the secretary or county inspector after diligent search within the district, it

shall be the duty of the board or the member thereof in whose district said nuisance shall exist, or the secretary or county inspector under his or their directions, to cause such nuisance to be at once abated by eradicating or destroying said insects or pests, or their eggs or larvæ, or by treating or disinfecting or destroying the infested or diseased articles. The expense thereof shall be a county charge, and the county court shall allow and pay the same out of the general fund of the county. Any and all sums so paid shall be and become a lien on the property and premises from which said nuisance shall have been removed or abated in pursuance of this act, and may be recovered by a suit in equity against such property or premises, which suit to foreclose such liens shall be brought in the circuit court of the county where the premises are situate by the district attorney in the name and for the benefit of the county making such payment or payments.

The proceedings in such cases shall be governed by the same rules, as far as may be applicable, as suits to foreclose mechanics' liens, and the property shall be sold under the order of the court and the proceeds applied in like manner. The board is hereby invested with the power to cause such nuisance to be abated in a summary manner.

PENNSYLVANIA.

AN ACT to provide for the protection of trees, shrubs, vines, and plants against destructive insects and diseases; providing for the enforcement of this act, the expenses connected therewith, and fixing penalties for its violation.

SECTION 1. *Be it enacted, &c.,* That no person shall knowingly or wilfully keep any tree, shrub, vine, or plant in any nursery, orchard, or public or private grounds in this Commonwealth, nor knowingly or willingly send out from such nursery any tree, shrub, vine, or plant affected with San Jose scale, or other insects or diseases, such as crown-gall, black-knot, or peach-yellows, destructive of such tree, vine, shrub, or plant.

SEC. 2. It shall be the duty of the secretary of agriculture, through the economic zoologist, or such other agent or agents as he may select, to cause an examination to be made, at least once each year, of each and every nursery in this State where trees, shrubs, vines, or plants are grown; and he may also, by himself or agent, make inspection of any orchard, or other grounds or place, in this State, for the purpose of ascertaining whether the trees, shrubs, vines, or plants therein kept are infested with San Jose scale or other insect pests, or diseases destructive of such trees, shrubs, vines, or plants. If, after such examination of any nursery, it be found that the said trees, shrubs, vines, or other plants, so examined, are apparently free in all respects from any such dangerously injurious insects or diseases, the secretary of agriculture, or his duly authorized agent, or other person designated to make such examination, shall thereupon issue to the owner or proprietor of the said stock thus examined a certificate setting forth the fact of the examination and that the stock or trees so examined are apparently free from any and all such destructive insects and diseases.

SEC. 3. Should any nurseryman, agent, dealer, or broker send out or deliver within the State trees, vines, shrubs, plants, buds, or cuttings, commonly known as nursery stock, and which are subject to the attacks of the insects and diseases designated in this act, unless he has in his possession a copy of said certificate, dated within the year thereof, or wrongfully be in possession of said certificate, he shall be guilty of a misdemeanor, and upon conviction shall be punished in accordance with the provisions of section eight of this act.

SEC. 4. All nursery stock, as designated in this act, sent out by any nurseryman, agent, dealer, or broker within this State, shall be accompanied by a copy of said certificate attached to each box, bale, or package. A certificate issued by an official of the United States, setting forth the fact that the nursery stock has been fumigated and is free from any and all such destructive insects and diseases, shall be accepted in lieu of the State inspection. Transportation companies are required to reject all nursery stock not accompanied with a certificate of inspection, and also to reject all such stock entering this State without a certificate of fumigation.

SEC. 5. Whenever any trees, shrubs, vines, or plants are shipped into the State from some other State, country, or province, every package thereof shall be plainly labeled on the outside with the name of the consignor, the name of the consignee, and a certificate showing that the contents have been inspected by a State or Government officer, and that the trees, vines, shrubs, or plants, excepting conifers and herbaceous plants, therein contained, are properly fumigated and appear free from all dangerously destructive insects and diseases. When nursery stock is shipped into this State, accompanied by a certificate as herein provided, it shall be held to be prima facie evidence of the facts therein stated; but the secretary of agriculture, by himself or his assistants, when they have reason to believe that any such stock is infested with dangerous insects or diseases, shall be authorized to inspect the same and subject it to like treatment as provided in sections six and seven of this act.

SEC. 6. If, after examination or upon information given in writing to the secretary of agriculture, it is found that any nursery stock, trees, or shrubs, either in a nursery or elsewhere, or sent forth to deliver in this State, are found to be infested with San José scale or other destructive insects or diseases, it shall be the duty of the secretary of agriculture, by himself or his duly authorized representative or agent, to take means to control, prevent the spread of, or secure the extermination of such insects or diseases, and shall have power to enter upon the premises and order the examination and treatment or destruction of such dangerously injurious insects or diseases, or the nursery stock or trees and shrubs infested therewith, giving written notice to the owner or person in charge of the premises or nursery stock so infested. Such notice shall contain a brief statement of the facts found to exist, and descriptions of methods whereby it is deemed necessary to treat or destroy said trees, shrubs, vines, or plants, and shall call attention to the law under which it is proposed to treat or destroy them. In case of objection to the findings of the inspector or agent of the secretary of agriculture, an appeal shall be made to the said secretary of agriculture, whose decision shall be final. An appeal must be taken within six days from the service of said notice, and shall act as a stay of proceedings until it is heard and decided.

SEC. 7. When the secretary of agriculture, or the persons or person appointed by him, shall finally determine, in accordance with the provisions of this act, that any trees, shrubs, vines, or other plants must be treated or destroyed, he shall notify in writing the owner or the person in charge of said infested stock, trees, vines, or shrubs, and shall direct him, within a time and in a manner prescribed in such notice, to treat or destroy such infested property. If the person so notified shall refuse or neglect to treat, destroy, or disinfect said trees, vines, or shrubs in the manner and within the time prescribed in the said notice, the secretary of agriculture shall cause such property to be so treated, and may employ all necessary assistants for that purpose; and such person or persons, agent or agents, employe or employes may enter on all premises in any township, borough, or city necessary for the purpose of such treatment, removal, or

destruction, and he shall certify to the owner or person in charge of the premises the amount of the cost of said treatment, removal, or destruction, and if not paid to him within sixty days thereafter, the same may be recovered, together with the costs of action.

SEC. 8. Any person violating the provisions of this act, or offering any hindrance to the carrying out of this act, shall be adjudged guilty of a misdemeanor, and, upon conviction before a magistrate or justice of the peace, shall be fined not less than ten dollars and not more than one hundred dollars for each and every offense, together with all the costs of the prosecution, and shall stand committed until the same is paid. All necessary expenses under the provisions of this act shall, after approval in writing by the secretary of agriculture and auditor-general, be paid by the State treasurer upon warrant of the auditor-general in the manner now provided by law: *Provided*, That not more than thirty thousand dollars shall be so expended for this purpose in any one year.

SEC. 9. All penalties and costs recovered for the violation of any of the provisions of this act shall be paid to the secretary of agriculture, or his agent, and by him immediately covered into the State treasury, to be kept as a fund for the use of the department of agriculture in the enforcement of this act, and may be drawn out upon vouchers signed by the secretary of agriculture and approved by the auditor-general, and shall not merge with the general fund at the close of any fiscal year.

SEC. 10. The provisions of this act shall not apply to florists' greenhouse plants and flowers, known as greenhouse stock, of varieties not attacked by San José scale or other injurious insects or diseases, nor shall they apply to ornamental trees and shrubs of varieties not liable to infestation with San José scale and liable to injury by fumigation.

SEC. 11. All acts or parts of acts inconsistent with the provisions of this act be, and the same are hereby, repealed.

Approved the 31st day of March, A. D. 1905.

PORTO RICO.

A BILL to provide for the protection against the importation of plant diseases or insects harmful to plants.

Be it enacted by the legislative assembly of Porto Rico:

SECTION 1. No coffee tree or plant, or any portion thereof, or the seeds of same (except roasted coffee for domestic consumption), and no rooted citrus plants or cuttings, and no cotton seed, seed cotton, cotton lint, loose or in bales, shall be brought into the island of Porto Rico from any State or Territory or other country whatsoever without having attached thereto, in a prominent and conspicuous place, a certificate under oath signed by a duly authorized State or Government entomologist, stating that such trees, plants, roots, seed hulls or seed or any and all portions thereof are free from disease: *Provided*, That in the case of cotton seed, seed cotton, cotton-seed hulls, or cotton lint, such certificate shall state in addition that the shipment originated in a locality where, by actual inspection by said attesting official or his agent, the Mexican boll weevil was not found to exist.

SEC. 2. None of the provisions of this act shall be construed as preventing the importation by the United States agricultural experiment station, without such certificate, of any trees, plants, shrubs, cuttings, seeds, roots, or bulbs required by it for experimental and official use, providing that such station notify the governor in writing of all shipments so made.

SEC. 3. The cities of San Juan, Ponce, and Mayaguez are hereby designated as ports of entry for any and all of said articles, and it shall be unlawful to enter the same at any other port or place.

SEC. 4. The governor is authorized to appoint suitable persons as inspectors, and shall from time to time issue such further and additional rules and regulations as may in his opinion be necessary for the guidance of said inspectors and the carrying out of the purpose of this act. Such inspectors shall have full power and authority to enter during reasonable hours any depot, warehouse, freight wharf, transfer, steamship, or express office, or other building or premises, and shall be allowed full access to all way bills, manifests, invoices, or bills of lading therein, whenever, in the opinion of said inspector, the same is necessary to determine the presence or record of any shipment of the nature designated in this act.

SEC. 5. No steamship, railway, express company, or other common carrier, or any person, firm, or corporation shall bring into the island of Porto Rico any of the articles above mentioned without the specified certificate attached, and each of such shipments shall be fully set forth in the manifest, way bills, invoices, or bills of lading of the importing company, specifying where and from whom such shipment was received and to whom consigned. Upon the arrival at any of the ports of entry herein designated, such common carrier shall notify the inspector of the arrival of such goods, and the same shall be held by said common carrier until the inspector has investigated such shipment and give written permission for its removal. In case any common carrier violates the provision of this section, then the general manager of such common carrier or the captain of such offending vessel shall be deemed guilty, and, upon conviction, punished in the manner hereinafter provided.

SEC. 6. Every transportation company, common carrier, person, firm, or corporation shall immediately notify the inspector at the nearest port of entry, when by oversight, negligence, or otherwise any shipments of the nature designated in section 1 of this act, without a proper certificate attached, shall arrive at any station or wharf owned or operated by said company within the island of Porto Rico, and it shall be the duty of such inspector to proceed as speedily as possible to investigate such shipment. If, upon investigation, he find the shipment to be of the nature herein designated, and to have been made without having first procured the proper certificate, he shall order the same removed from the island of Porto Rico, and upon failure of the owner or shipper to remove same within forty-eight hours after notice to do so said shipment shall be seized and burned.

SEC. 7. Any person or persons, firm, corporation, company, or common carrier violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished as provided for in section 16 of the Penal Code of Porto Rico of 1902; and any person who shall refuse to comply with the instructions of an inspector, or shall hinder or obstruct, or offer to hinder or obstruct, any inspector in the discharge of his duties, shall be deemed guilty of a misdemeanor, and upon conviction shall be punished as provided for in said section 16, above referred to.

SEC. 8. For the purpose of carrying out the provisions of this act, there is hereby appropriated out of any moneys in the treasury not otherwise appropriated, for the fiscal year ending June 30th, 1906, the sum of five hundred dollars (\$500.00) or so much thereof as may be necessary.

SEC. 9. This law shall take effect on and after May first, 1905.

RHODE ISLAND.

CHAPTER 1159.

AN ACT to authorize the State board of agriculture to appoint a State nursery inspector, and to provide for the protection of trees and shrubs from injurious insects and diseases.

It is enacted by the general assembly as follows:

SECTION 1. The State board of agriculture may annually appoint some person, qualified by scientific training and practical experience, to be State nursery inspector, who shall be responsible to the board for the performance of his duties as prescribed in this act.

SEC. 2. It shall be the duty of the State nursery inspector to inspect, under the direction of said board, all nurseries or places in the State where nursery stock is grown, sold, or offered for sale, and if no dangerous insect or fungus pests are found therein a certificate to that effect shall be given. If such pests are found therein the owner of the stock shall take such measures to suppress the same as the State nursery inspector shall prescribe, and no certificate shall be given until the said inspector has satisfied himself by subsequent inspection that all such pests have been suppressed.

SEC. 3. Owners of nurseries or of places in the State where nursery stock is grown, sold, or offered for sale, who do not hold an unexpired certificate of inspection after the first annual inspection made after the passage of this act, who shall sell or otherwise dispose of nursery stock in the State shall be subject to a penalty of not less than ten nor more than fifty dollars for each offence.

SEC. 4. Owners of nurseries or of places in the State where nursery stock is grown, sold, or offered for sale, who shall fumigate with hydrocyanic acid gas all stock which they sell, using at least two-tenths of a gram of potassic cyanide to every cubic foot of space contained in the box, house, or other place wherein this fumigation is performed, which place shall be gas tight, and who shall expose the said stock to the fumes of this gas of the strength aforesaid for at least forty minutes, or who shall treat the stock which they sell by some other method approved by the State nursery inspector, and who shall make affidavit before an officer authorized to administer oaths that all stock sold by them has thus been fumigated or treated, and who shall attach a copy of such affidavit to each package, box, or car of stock sold, shall be exempt from the provisions of sections two and three of this act.

SEC. 5. All nursery stock shipped into this State from any other State, country, or province shall bear on each box or package a certificate that the contents of said box or package have been inspected by a duly authorized inspecting officer and that said contents appear to be free from all dangerous insects or diseases. In case nursery stock is brought within the State without such a certificate the consignee shall return it to the consignor at the expense of the latter: *Provided, however,* That any package or box bearing a certificate of fumigation which meets the requirements specified in section four of this act may be accepted as though bearing a proper certificate of inspection.

SEC. 6. The State nursery inspector shall at all times have the right to enter any public or private grounds in the performance of any duty required by this act. He shall receive from the annual appropriation of the State board of agriculture such compensation as said board may determine.

SEC. 7. This act shall take effect upon its passage.

Passed April 13, 1904.

SOUTH CAROLINA.

AN ACT to amend an act to create a State board of entomology, to define its power and prescribe its duties and provide for the inspection of fruit trees, vineyards, and vegetable farms, to prevent contagious diseases, and destroy destructive insects in orchards, vineyards, and other places in the State.

SECTION 1. *Be it enacted by the general assembly of the State of South Carolina*, That on or before April 1st, 1901, and every two years thereafter, the board of trustees of Clemson College shall designate three members of the said board who shall constitute and be known as the State board of entomology and who shall be charged especially with the execution of the provisions of this act.

SEC. 2. That the said board is hereby authorized and empowered to make such rules and establish such regulations consistent with the laws of this State and of the United States for the government of the inspection, certification, sale, transportation, and introduction of trees, plants, shrubs, cuttings, buds, vines, bulbs or roots that the said board may deem necessary or advisable to prevent the introduction or dissemination of destructive insects and plant diseases.

SEC. 3. That the said board shall have power to appoint an entomologist, who shall be a skilled horticulturist, and an assistant entomologist if, in their judgment, it shall be impracticable for the entomologist so to be appointed to discharge the duties hereby devolved upon him; and such entomologist shall act as an inspector under the provisions of this act; and it shall be the duty of said board to promulgate rules and regulations in accordance with this act for the guidance of said entomologist and his assistant, if one shall be appointed, in the duties devolving upon him under the provisions hereof.

SEC. 4. That the said board shall fix the salary of said entomologist and of his assistant, if one shall be appointed. The said salary shall be paid out of the funds now provided by law for the uses of Clemson College. And in addition to said salaries such expenses as the said board may allow for traveling and other incidental expenses of the entomologist and his assistant and the issuing of reports or other publications shall be paid out of the funds provided for the uses of Clemson College.

SEC. 5. That the said entomologist, or his assistant, is hereby authorized and empowered to enter upon any premises in this State for the discharge of the duties hereby prescribed, or that may be prescribed by said board, and any person or persons who shall pester or hinder him in the discharge of such duties shall be deemed guilty of a misdemeanor, and upon conviction shall be punished by a fine not exceeding one hundred dollars or by imprisonment in the county jail not exceeding thirty days.

SEC. 6. The entomologist shall have power under the regulations of the said board to visit any section of the State where insects injurious to or destructive to plants are believed to exist and shall determine whether any infested trees or plants or vineyards are worthy of remedial treatment or should be destroyed, and he shall report his findings in writing to the owner of the premises where such trees or plants or vineyards are situated, or to his agent or tenant, and a copy of his report shall also be submitted to the said board. In case of objection to the finding or report of the inspector, an appeal may be had to the said board, who shall have the power to summon witnesses and hear testimony on oath, and whose decision shall be final. Upon the finding of the inspector in any case of infested trees or plants or vineyards, the treatment prescribed by him shall be executed by the owner of the premises unless an appeal is taken, and the cost of material incident to such treatment shall be borne by the owners of the premises: *Provided, however*, That in case the trees or plants or

vineyards shall be condemned by the inspector, they shall be destroyed, by his direction, by the owner of the premises, and the expense of said action shall be borne by the owner of the premises: *Provided*, That failure or refusal on the part of the owner of the premises to execute the treatment prescribed by the entomologist, or to destroy trees, plants, or vineyards, as directed by him, shall be deemed a misdemeanor, and, upon conviction thereof, such owner shall be punished by a fine not exceeding one hundred dollars, or imprisonment in the county jail not exceeding thirty days: *And provided further*, That the provision in reference to destroying plants shall not refer to cotton, corn, grain, or such other field plants as are not subject to sale and transportation. No compensation shall be paid to the owner of the premises for any plant that shall thus be destroyed.

SEC. 7. It shall be unlawful to sell or offer for sale or transport within this State plants, buds, trees, shrubs, vines, tubers, roots, or cuttings that have not been inspected or bear the inspection tag of the said entomologist, and any person or persons violating the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction shall be fined in a sum not exceeding one hundred dollars, or imprisonment in the county jail not exceeding thirty days.

SEC. 8. It shall be unlawful for any grower of fruit trees, nurserymen, or corporation to ship within this State any trees, shrubs, cuttings, vines, bulbs, or roots without having the same previously examined by said entomologist, or by his assistant, within six months next preceding date of such shipment—a certificate of such inspection in such form as may be adopted by said board to accompany each box or package. Any person or corporation violating the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding one hundred dollars, or be imprisoned in the county jail not exceeding thirty days.

SEC. 9. That all fruit growers, nurserymen, or corporations residing in this State dealing in or handling fruit trees, shrubs, cuttings, vines, bulbs, or roots shall be compelled to have his or their or its stock inspected annually on or before the 1st day of November of each year. If upon such inspection such stock is found to conform to the requirements of said board, the inspector shall furnish a certificate to that effect: or if such stock does not conform to the requirements of said board then the said inspector may cause the same to be destroyed at the expense of the owner thereof.

SEC. 10. That all persons or corporations residing without the limits of the State dealing in trees, plants, cuttings, shrubs, vines, or roots shall register his, their, or its name and file a copy of his, their, or its certificate of inspection furnished by the entomologist or inspector or duly authorized official of the State in which he, they, or it resides with the chairman of the said board, which shall state that in addition to inspection the nursery stock has been fumigated under the direction of the official issuing the certificate. Upon failure to comply with this requirement, any of said articles that may be shipped into this State may be confiscated or destroyed by the authority of the said board.

SEC. 11. Upon filing the proper certificate, as above prescribed, and upon request of any person or persons residing without the limits of this State, dealing in or handling trees, shrubs, cuttings, vines, bulbs, or roots in this State, the certificate of the said board of entomology will be issued to the same without charge, and official tags bearing the *fac simile* copy of such certificate and the seal of the board of entomology will be furnished such applicants at cost.

SEC. 12. No transportation company or common carrier shall deliver any

box, bundle, or package of trees, shrubs, cuttings, vines, bulbs, or roots shipped by parties residing without the limits of this State to any consignee at any station in this State unless each box, bundle, or package is plainly labeled with a certificate of inspection furnished by the official entomologist of the State in which said stock was grown and also with the official tag of this board herein provided for. Any person or persons violating the provisions of this section shall be deemed guilty of a misdemeanor, and, upon conviction, shall be fined in a sum not exceeding one hundred dollars. For the enforcement of this section the sheriff of each county in the State is hereby authorized and empowered, and it shall further be his duty, to seize such goods that do not bear the official tag of this board and hold the same until inspected and pronounced by the entomologist, whom he shall notify at once, to be free from the diseases and insects declared to be injurious by the said board.

SEC. 13. When two or more reputable citizens of any county in this State notify the chairman of the State board of entomology that noxious insects or plant diseases exist in their county it shall be his duty to have the entomologist promptly investigate the matter and take such steps as authorized and prescribed in this act and by the State board of entomology.

SEC. 14. This act shall take effect from and after its passage.

Approved the 23d day of February, A. D. 1903.

RULES AND REGULATIONS ADOPTED BY THE STATE BOARD OF ENTOMOLOGY.

1. The entomologist at Clemson College, who shall be known as State entomologist, shall direct the work required under this act. He shall inspect every nursery in the State before the first day of November of each year. All nurserymen and dealers of nursery stock residing within and without the State who do business within the limits of the State of South Carolina, must not sell, transport, or give away any nursery stock, unless the same is accompanied by a certificate from the State board of entomology declaring the same to be apparently free from insects and plant diseases herein listed as dangerously injurious. All such certificates are invalid after the first day of June of each year and must be renewed before the first day of November of that year. When nursery premises are found to be infested, the certificate of freedom from injurious insects and plant diseases will be withheld until the instructions of the entomologist for the treatment of same have been obeyed. Infested orchards shall be treated whenever discovered. The owners of infested nurseries or orchards shall pay all cost for such treatment, except the traveling and hotel expenses of the entomologist.

The entomologist shall exercise all due diligence to see that the law is complied with, and he shall publish, from time to time, circulars and reports relating to the inspection work, and bulletins containing an account of the habits of and treatment for the injurious insects and plant diseases.

In the office of the entomologist, there shall be kept, on file, a list of nurserymen and dealers of nursery stock, living within and without the State, and doing business within the State, and a list of localities within the State where the San Jose scale and other dangerously injurious insects and plant diseases have been found.

All correspondence relating to the inspection, certification, and treatment of trees, plants, and all kinds of nursery stock should be addressed to the State entomologist, who shall also act as secretary to the State board of entomology.

2. The following insects and plant diseases are declared by the State board of entomology to be dangerously injurious and the introduction of the same is

hereby forbidden, and to be prevented, as far as possible, in accordance with the law:

San Jose scale (*Aspidiotus perniciosus*), woolly aphis (*Schizoneura lanigera*), black knot of plum and cherry (*Plowrightia morbosa*), fire blight of pear and apple (*Micrococcus amylovorus*), peach yellows, the plum and peach rosette, and crown gall.

The certificate of inspection is invalid unless accompanied by a certificate of fumigation.

No. 265.

AN ACT to guard against the introduction of Mexican boll weevil into this State.

Whereas a pest commonly designated as the Mexican boll weevil is a great actual evil in the State of Texas and is a menace to the whole cotton belt, and is ascertained to be capable of dissemination in cotton seed; therefore:

SECTION 1. *Be it enacted by the general assembly of the State of South Carolina*, That on and after the approval of this act by the governor, it shall be unlawful to import into this State any living specimen of the Mexican boll weevil or to import into this State any cotton seed, oats, or prairie hay from points affected by said weevil in the State of Texas, or from any other point or points any such seed or hay that has been shipped originally from any point or points affected by said weevil in the State of Texas.

SEC. 2. That every person and every agent of any firm or corporation violating the provision of section 1 of this act shall, on conviction, be deemed guilty of a misdemeanor and shall be subjected to a fine not to exceed one hundred dollars or imprisonment not exceeding thirty days; and all such weevils shall be seized and destroyed; and all such imported cotton seed, oats, or prairie hay shall be deemed contraband, and seized and destroyed upon the conviction of the person or agent violating section 1 of this act.

Approved the 25th day of February, A. D. 1904.

SOUTH DAKOTA.

CHAPTER 131.

AN ACT to prevent the introduction and spread of injurious insects and dangerous plant diseases in the State of South Dakota.

Be it enacted by the legislature of the State of South Dakota:

§ 1. The entomologist of the State experiment station is hereby constituted the State entomologist and charged with the execution of this act. He shall, between the first day of June and the fifteenth day of September of each year, when requested by the owner or agent, or when he has reasonable grounds to believe that any injurious insect pests or dangerous and contagious plant diseases exist, examine any nursery, fruit farm, or other place where trees or plants are grown for sale, and if found apparently free from any injurious insect pests or dangerous plant diseases he shall issue his certificate stating the facts (good for one year unless revoked), and shall collect therefor a fee sufficient to cover his expenses.

§ 2. The State entomologist shall have authority, when requested by the

owner, agent, or purchaser, or when he has reasonable grounds to believe that any such injurious and dangerous pests exist, to enter upon any of the grounds mentioned in section one hereof, public or private, for the purpose of inspection, and if he finds any nursery or orchard, garden, or other place inspected [infected] by any such injurious and dangerous pests, he may enter upon such premises and establish quarantine regulations. If in his judgment any such injurious and dangerous pests may be eradicated by treatment, he may, in writing, order such treatment and prescribe its kind and character. In case any trees, shrubs, or plants are found so infested that it would be impracticable to treat them he may order them burned. A failure for ten days after the delivery of such orders to the owner or person in charge to treat or destroy such infected plants or trees, as ordered, shall make it the duty of the entomologist to perform this work, and to ascertain the cost thereof, and he shall certify the amount of such costs to the owner or person in charge of the premises, and if the same is not paid him within sixty days thereafter he shall certify the amount thereof to the State's attorney of the county in which the said infested trees or plants are found, whose duty it shall be to proceed forthwith to collect the same of him in a civil suit, and to turn the amount so recovered over to the State auditor to reimburse the State for the money so expended.

§ 3. When nursery stock is shipped into the State, accompanied by a certificate of inspection by a State entomologist from the State from which said nursery stock was shipped, stating that the stock has been inspected and found to be free from any injurious insect pests and dangerous and contagious plant diseases, it shall be held prima facie evidence of the facts therein stated; but the State entomologist, when he have reason to believe that any such stock is nevertheless infested by any such injurious and dangerous pests, shall be authorized to inspect the same and submit it to like treatment as that provided for in section two hereof; and if, by reason of the failure for forty-eight hours of the owner of such stock to comply with the treatment prescribed or to destroy the stock if so ordered, the State entomologist is required to perform the work himself, and it shall be the duty of the entomologist to certify the amount of the cost thereof to the owner or person in charge of such stock so treated or destroyed, and if the same is not paid to him within ten days thereafter he shall certify the amount thereof to the State's attorney of the county in which the stock may be found in an affidavit, and it shall be the duty of such county attorney to file such affidavit with the register of deeds of the county in which said stock may be, and the same shall thereupon constitute a lien thereon, which it shall be the duty of such State's attorney to proceed to collect forthwith in a civil suit and to turn over the amount so recovered by him in such suit to the State auditor to reimburse the State for the money so expended.

§ 4. It shall be unlawful for any person, firm, or corporation to bring into this State any trees, plants, vines, cuttings, or buds, commonly known as nursery stock, unless accompanied by a certificate of inspection by a State entomologist of the State from which the shipment is made, showing that the stock has been inspected and found apparently free from any injurious insect pests or dangerous and contagious plant diseases.

§ 5. Any persons violating or failing to carry out the provisions of this act or offering any hindrance to the same shall be adjudged guilty of a misdemeanor, and upon conviction before any court having proper jurisdiction, shall be fined not less than ten dollars nor more than one hundred dollars for each and every offense, together with all the costs of the prosecution, and shall stand committed until the same is paid.

Approved March 6, 1905.

TENNESSEE.

CHAPTER 442.

AN ACT to create a State entomologist and plant pathologist; to provide quarantine rules and other rules and regulations regarding the sale, transportation, and delivery of trees, shrubs, vines, plants, or plant products so as to prevent the dissemination of injurious insect pests, also to amend said acts so as to make it unlawful for any person, firm, or corporation to knowingly grow, sell, offer for sale, or give away, transport, keep, or permit to be kept, any plants, trees, shrubs, vines or any part of a plant infected with injurious insects, insect pests, and contagious plant diseases, and to otherwise provide for the duties and powers of said State entomologist and plant pathologist and to regulate the sale and transportation and inspection of trees, plants, roots, bulbs, plants, and plant products.

SECTION 1. *Be it enacted by the general assembly of the State of Tennessee,* That it shall be unlawful for any person, firm, or corporation knowingly to grow, sell, offer for sale, give away, transport, keep, or permit to be kept upon his or their premises any plants, trees, shrubs, vines, or any part of a plant infested with injurious insect pests and contagious plant diseases.

SEC. 2. *Be it further enacted,* That within thirty days after the passage of this act the commissioner of agriculture shall appoint a competent entomologist and plant pathologist, subject to the approval of the governor, and necessary assistants, who shall, under the authority of said commissioner, be charged with the duty of inspecting trees, vines, shrubs, plants, or any part thereof as prescribed in this act.

SEC. 3. *Be it further enacted,* That the commissioner of agriculture and said State entomologist and plant pathologist, who shall constitute and be designated as the "State board of entomology," shall have plenary power to enact such rules and regulations for the enforcement of the provisions of this act as may be necessary to prevent, control, and eradicate the further introduction, increase, and dissemination of insect pests and fungus diseases, which otherwise would threaten the fruit and other agricultural interests of this State.

SEC. 4. *Be it further enacted,* That it shall be the duty of the State entomologist and plant pathologist, or his assistants, to inspect annually, or oftener, if necessary, all greenhouses and nursery stock grown within the bounds of the State prior to September 1st of each year, and he or they shall issue a certificate of freedom from insect pests and plant diseases to the owner or lessee of any greenhouse or nursery, or other persons who give away, sell, or transport nursery stock, found entitled to the same. All certificates of inspection shall be given not later than November 1st of each year, and shall become void after August 1st of the year following. A duplicate copy of each certificate shall be filed by the State entomologist and plant pathologist with the commissioner of agriculture not later than thirty (30) days from the time of issue.

SEC. 5. *Be it further enacted,* That it shall be lawful for the State entomologist and plant pathologist, acting under the authority of the State board of entomology, or his assistants or authorized agents, to visit any section of the State and examine any or all fruit-bearing, ornamental, or shade trees, or any field truck crop or garden crops, or any plants or parts thereof, of any description whatsoever, and determine whether infectious diseases exist or not. If discovery is made of injurious insect pests or fungus diseases, a report in writing of such finding shall be made to the owner of the infested plantation, his agents or tenants, and a copy of such report shall be filed with the State board of entomology. If any objections are made against the findings of the State entomologist and plant pathologist or any of his authorized assistants, such

objections must be made in writing within ten (10) days of the finding to the said board, who shall have power to summon witnesses and hear testimony on oath, and whose decision shall be final. Any person or persons who shall interfere with the duties of said entomologist and said board, as prescribed in this section, shall be considered guilty of a misdemeanor, and he or they shall be fined not less than twenty-five (\$25) dollars nor more than fifty (\$50) dollars for each offense.

SEC. 6. *Be it further enacted*, That upon discovery by the State entomologist and plant pathologist of dangerous insect pests and fungus diseases, whether in greenhouses and nurseries or in private or public domain, the treatment prescribed by the State entomologist and plant pathologist shall be executed at once (provided there is no appeal), and under his supervision. If the case in question is worthy of remedial treatment, the cost of the material and the labor shall be borne by the owner. In case infested stock is not worthy of remedial treatment, such infectious plants shall be placed under the jurisdiction of the board of control.

SEC. 7. *Be it further enacted*, That it shall be unlawful for any grower, nurseryman, florist, dealer, or corporation to ship, sell, or deliver within the State any trees or plants of whatever description without having been previously inspected by the State entomologist and plant pathologist, or his authorized assistants, and a certificate of inspection, which is a facsimile signature of the original certificate, placed upon each bundle, package, bale, box, or carload of shipment.

Any violation of said certificate by changing, defacing, or placing it on uninspected or infested stock, or using the same after date of expiration or revocation, shall render the owner or shipper liable to a fine of not less than one hundred (\$100) dollars nor more than one hundred and fifty (\$150) dollars for each offense: *Provided*, That the provisions of this act shall not apply to farmers or small growers who may sell plants, flowers, or shrubs in their own counties.

SEC. 8. *Be it further enacted*, That each and every individual, firm, or corporation residing in other States, Territories, provinces, etc., dealing in or handling trees, plants, vines, shrubs, bulbs, roots, cuttings, etc., before shipping into the State shall register his name, firm, or corporation and file a copy of his or its certificate of inspection, furnished by the entomologist, fruit inspector, or duly authorized government official of his State, country, or province, with the secretary of the State board of entomology. All packages, boxes, bales, carloads of plants, commonly known as greenhouse or nursery stock, imported into the State shall be plainly labeled on the outside with the names of the consignor and consignee, and a certificate showing that the said contents had been inspected by a reputable State or Government official. Upon the failure of any person or persons to subscribe to the declarations set forth in this section, said stock shall be confiscated under the order of the State entomologist and plant pathologist.

SEC. 9. *Be it further enacted*, That the Tennessee State board of entomology shall have the power to adopt such quarantine rules and other regulations, not inconsistent with the constitution of the State and United States, as they may deem necessary to prevent the introduction of dangerously injurious fruit or crop pests or diseases from without the State, and to govern common carriers in transporting shipments liable to harbor such pests or diseases to or from the State, and such regulations shall have the force of law.

SEC. 10. *Be it further enacted*, That any agent, common carrier, railroad, steamboat, or express company found delivering within the bounds of the State

any plants, trees, shrubs, vines, cuttings, bulbs, roots, etc., under conditions otherwise than that provided in this act, shall be found guilty of a misdemeanor and fined not less than twenty-five (\$25) dollars nor more than fifty (\$50) dollars for the first offense and one hundred (\$100) dollars for each offense thereafter.

SEC. 11. *Be it further enacted*, That all nursery stock sold, shipped, or delivered within this State or shipped into this State from other States shall be treated or fumigated as may be required by the regulations of the Tennessee State board of entomology hereinbefore provided for.

SEC. 12. *Be it further enacted*, That upon knowledge coming from any county within the State to the board of control that noxious insect pests or plant diseases exist in said county, or in close proximity in an adjoining county, the State entomologist and plant pathologist shall be empowered by said board to investigate as speedily as possible the supposed infectious district; and if, upon examination, dangerous insect pests or infectious plant diseases are disclosed, such infected premises shall be treated in accordance with this act, as prescribed in sections 5 and 6.

SEC. 13. *Be it further enacted*, That the State entomologist and plant pathologist shall submit to the State board of entomology a monthly report of work done. He shall also submit an annual report on or before the first of February of each year to the governor of the State, embracing a review of inspections and investigations made and the condition of the State relative to insect pests and plant diseases, which shall be published, as are other State reports, for general distribution.

SEC. 14. *Be it further enacted*, That the sum of two thousand (\$2,000) dollars annually be, and is hereby, appropriated to the State board of entomology in order to carry out the provisions of this act—namely, to employ a competent State entomologist and plant pathologist; to procure the requisite facilities and equipment necessary for the proper discharge of duties herein incurred; to support a reasonable amount of investigation in addition to the inspection work of the State, and to publish the results of observations and investigations made in bulletin form, which may disseminate information that will prove useful to the agricultural and horticultural interests of the State.

SEC. 15. *Be it further enacted*, That the comptroller of the State be, and is hereby, authorized to issue his warrant upon the State treasurer for the sum of two thousand (\$2,000) dollars annually out of any funds not otherwise appropriated; that the said sum of money shall be made payable quarterly to the State board of entomology and only upon the presentation of the proper vouchers.

SEC. 16. *Be it further enacted*, That the State board of entomology shall have power to adopt such rules and regulations governing insect and plant pests within the bounds of the State as are not inconsistent with the constitution of the State and the United States; that said board shall, within sixty (60) days from the passage of this act, draft and publish through the State press all rules and regulations necessary to carry into full and complete effect the embodiment of this act, cautiously and wisely outlining the diseases and maladies caused by both insect and fungus, and explaining what constitutes infectious plant diseases in the eyes of the law.

SEC. 17. *Be it further enacted*, That this act shall take effect from and after its passage, the public welfare requiring it; and that all laws or parts of laws in conflict with this act are hereby repealed.

Approved April 17, 1905.

AMENDED RULES AND REGULATIONS OF THE STATE BOARD OF ENTOMOLOGY.

1. The following insects and fungous diseases are declared to constitute infestation in trees and plants :

The San Jose scale (*Aspidiotus perniciosus*).

The new peach scale (*Aulacaspis pentagona*).

The woolly aphis of apple (*Schizoneura lanigera*).

The Mexican cotton boll weevil (*Anthonomus grandis*).

Black knot of cherry and plum (*Plowrightia morbosa*).

Crown gall.

Rosette of peach and plum.

Yellows of peach.

2. Every person, firm, and corporation desiring to conduct the business of a nursery or to sell fruit and ornamental trees and plants, commonly known as nursery stock, shall apply to the State entomologist, Knoxville, Tenn., on or before July 1, 1906, and annually thereafter, for the inspection of their nursery stock; and they shall inform the State entomologist of the location of the nursery or nursery stock to be inspected, its acreage, extent, and amount, so that arrangements can be made for the prompt inspection of said stock.

3. Nursery stock is construed to include all fruit, shade, ornamental, and nut trees, bush fruits, grapevines, and strawberry plants, and all buds, grafts, cions, and cuttings from same.

4. In accordance with section 11 of the law, all trees, buds, grafts, scions, or cuttings of apple, apricot, cherry, peach, pear, plum, and quince, which shall be sold in the State of Tennessee, shall be fumigated shortly before shipment or delivery with hydrocyanic acid gas.

At the time of the nursery inspection the fumigating house or box shall also be inspected, and must be found in a satisfactory condition; otherwise no certificate can be granted.

5. No person, firm, or corporation shall sell, offer for sale, exchange, barter, or give away any nursery stock grown within the State of Tennessee, unless in possession of a valid certificate of inspection previously obtained from the State board of entomology.

6. The State entomologist, or his assistants, shall, on or before September 1 of each year, inspect all nurseries and nursery stock within the State, and if found free of infestation a certificate of inspection shall be issued covering same, good until August 1 of the year following.

7. If infestation is found in any nursery, greenhouse, or nursery stock, the certificate shall be withheld until the premises have been so treated that the salable stock to be covered by said certificate shall be free from such infestation; and such treatment shall be prescribed by the entomologist making the inspection.

In case part of a nursery shall be found infested, no certificate shall be granted, but isolated blocks of nursery stock not infested may be considered as separate nurseries, and a certificate covering such stock may be issued after all the infested blocks have been treated as ordered by the inspector. If in the judgment of the inspector infested stock is in so bad a condition as to be unworthy of remedial treatment, it shall be destroyed, subject to appeal, as provided by law.

8. On complaint to the State entomologist by any citizen that infestation exists in any orchard, garden, or other grounds, said grounds shall be inspected by the entomologist or his assistant. If the infested plants can be saved by remedial action the inspector shall prescribe treatment, but if the infestation is so great that, in the judgment of the inspector, the plants are not worth treatment, they

shall be destroyed at the expense of the owner. Appeal can be made to the State board of entomology, as provided by law.

9. Every carload, box, bale, package, or delivery of nursery stock which is sold, exchanged, etc., by any person, firm, or corporation within the State of Tennessee, shall be accompanied by a copy of the certificate of inspection plainly and securely attached. This means that every individual sale or bill shall bear a copy of the certificate. Any nursery stock not thus marked is liable to be destroyed without compensation to the consignor, who is further liable to a fine of not less than \$100.00. No transportation company, or agent thereof, may accept for shipment any nursery stock not accompanied by a copy of certificate of inspection.

10. Any person, firm, or corporation without the State of Tennessee, desiring to do business within this State shall file with the State entomologist, who is also secretary of the board, at Knoxville, Tenn., a copy of his certificate of inspection issued by the proper official of his State. And every shipment of nursery stock shipped into the State of Tennessee must be accompanied by a copy of such certificate of inspection.

11. Shipments of nursery stock not properly labeled shall be refused for shipment by all common carriers and their agents. Transportation companies and their agents shall immediately notify the State entomologist and plant pathologist, Knoxville, Tenn., when by oversight, negligence, or otherwise any shipment of nursery stock without a proper certificate attached shall arrive at any station or wharf in this State, and it shall be the duty of the entomologist and plant pathologist or his assistant as speedily as possible to investigate and dispose of such shipment.

12. In accordance with section 9 of the law, and in order to prevent the importation of the Mexican cotton boll weevil into Tennessee from the State of Texas and the infested portion of Louisiana, a quarantine is hereby declared against the following counties of the State of Texas:

Anderson,	Duval,	Johnson,	Red River,
Angelina,	Eastland,	Karnes,	Refugio,
Aransas,	Ellis,	Kaufman,	Roberson,
Atascosa,	Erath,	Kent,	Rockwell,
Austin,	Falls,	Kendall,	Rusk,
Bastrop,	Fannin,	Lamar,	Sabine,
Bee,	Fayette,	Lampasas,	San Augustine,
Bell,	Fort Bend,	Lavaca,	San Jacinto,
Bexar,	Franklin,	Lee,	San Patricio,
Blanco,	Freestone,	Leon,	San Saba,
Bosque,	Galveston,	Liberty,	Shelby,
Bowie,	Gillespie,	Limestone,	Smith,
Brazoria,	Goliad,	Live Oak,	Somervell,
Brazos,	Gonzales,	Llano,	Starr,
Brown,	Grayson,	Madison,	Stephens,
Burleson,	Gregg,	Marion,	Tarrant,
Burnet,	Grimes,	Matagorda,	Titus,
Caldwell,	Guadalupe,	McLellan,	Travis,
Calhoun,	Hamilton,	McMullen,	Trinity,
Cameron,	Hardin,	Milam,	Tyler,
Camp,	Harris,	Mills,	Upshur,
Cass,	Harrison,	Montague,	Van Zandt,
Chambers,	Hays,	Montgomery,	Victoria,
Cherokee,	Henderson,	Morris,	Walker,
Collin,	Hidalgo,	Nacogdoches,	Waller,
Colorado,	Hill,	Navarro,	Washington,
Comal,	Hood,	Nueces,	Wharton,
Comanche,	Hopkins,	Newton,	Williamson,
Cook,	Houston,	Orange,	Wilson,
Coryell,	Hunt,	Palo Pinto,	Wise,
Dallas,	Jack,	Panola,	Wood,
Delta,	Jackson,	Parker,	
Denton,	Jasper,	Polk,	
Dewitt,	Jefferson,	Rains,	

and the following parishes of Louisiana: Bossier, Caddo, Calcasieu, Cameron, De Soto, Grant, Sabine, St. Landry, and Vernon, as well as those portions of Red River, Natchitoches, and Rapides parishes lying west of the Red River.

(a) No cotton lint (loose, baled, flat, or compressed), cotton seed, seed cotton, cotton-seed hulls, seed-cotton or cotton-seed sacks (which have been used), or corn in the shuck shall be shipped into Tennessee from the infested counties of Texas and parishes of Louisiana, as above enumerated.

(b) Shipments of household goods from the infested areas of Texas and Louisiana shall not be admitted into Tennessee unless accompanied by an affidavit attached to the waybill, to the effect that the shipment contains no cotton lint, cotton seed, seed cotton, cotton-seed hulls, seed-cotton or cotton-seed sacks, or corn in the shuck.

(c) It shall be unlawful for anyone in Tennessee to have in his possession live Mexican cotton boll weevils. The public is urged to recognize the danger of introducing unwittingly live boll weevils for inspection, observation, or experiment.

Adopted February 12, 1906.

TEXAS.

AN ACT to prevent the keeping of certain fruit trees affected with yellows, crown gall, black knot, or any tree, shrub, or plant infested with or by San Jose scale or other dangerous, injurious, or destructive pest; and declaring such affected and infested trees, shrubs, and plants a public nuisance, and making it the duty of the commissioner of agriculture, insurance, statistics, and history to seek out and destroy such trees, shrubs, and plants, or cause the same to be done, or to have such affected or infested trees treated; and providing the manner of such destruction and treatment, and for an investigation by the commissioner of agriculture, insurance, statistics, and history when he believes, or has reason to believe, that any such diseases or pests may exist in this State, and providing the manner of combating such diseases and pests, and the prevention of their spread and dissemination; providing for the examination of nurseries and giving certificates to that effect; regulating the importation of trees, shrubs, and plants from without the State; forbidding the selling, consigning, or shipping of nursery stock without such certificates; providing for the fumigation of certain trees, shrubs, and plants; providing penalties, and making an appropriation, and declaring an emergency.

SECTION 1. *Be it enacted by the legislature of the State of Texas*, No person in this State shall knowingly or willfully keep any peach, almond, apricot, or nectarine trees affected with the contagious disease known as yellows. Nor shall any person keep any peach, plum, or other tree affected with crown or root gall, nor shall any person knowingly or willfully keep any plum, cherry, or other trees affected with the contagious disease or fungus known as black knot, nor any tree, shrub, or plant infested with or by the San Jose scale or other insect pest dangerously injurious to or destructive of trees, shrubs, or other plants; every such tree, shrub, or plant shall be a public nuisance, and as such shall be abated, and no damage shall be awarded for entering upon premises upon which there are trees, shrubs, or plants infected with yellows, black knot, crown gall, or other infectious dangerous disease, or infected with San Jose scale or other dangerous insect pest, for the purpose of legally inspecting the same, nor shall any damages be awarded for the destruction by the commissioner of agriculture, insurance, statistics, and history, or his duly authorized agents or representatives, of such trees, shrubs, or plants, or altogether destroying such trees if necessary to suppress such disease, if done in accordance with the provisions of this article, except as otherwise herein provided. Every person, when he becomes aware of the existence of such disease or insect pest in any tree owned by him, shall forthwith report the same to the commissioner of agriculture, at Austin, Texas, and the said commissioner shall take such action as the law provides. If in the judgment of said commissioner, or the person or

persons representing him, the trees, shrubs, or other plants so infected, infested, or diseased should be destroyed, then such destruction shall be carried on and completed under the supervision of said commissioner, or the person or persons duly appointed by him and authorized so to do, without unnecessary delay; but the owner of the trees, shrubs, or plants shall be notified immediately upon its being determined that such trees, shrubs, or plants should be destroyed by a notice in writing signed by said commissioner, or the person or persons representing him, which said notice in writing shall be delivered in person to the owner of such trees, shrubs, or plants, or left at the usual place of residence of such owner, or if such owner be not a resident of the locality, to notify by leaving such notice with the person in charge of the premises, trees, shrubs, or plants, or in whose possession they may be; such notice shall contain a brief statement of the facts found to exist, whereby it is necessary to destroy such trees, shrubs, or plants, and shall call attention to the law under which it is proposed to destroy them, and the owner shall within ten days from the date upon which such notice shall have been received remove and burn all such diseased or infected trees, shrubs, or plants. If, however, in the judgment of said commissioner, or person representing him, any trees, shrubs, or plants infected with any disease or infested with dangerously injurious insects can be treated with sufficient remedies, he may direct such treatment to be carried out by the owner under the direction of the commissioner's agent or agents. In case of objections to the findings of the inspector or agent of the commissioner, an appeal may be made to the commissioner, whose decision shall be final. An appeal must be taken within three days from service of said notice, and shall act as a stay of proceedings until it is heard and decided. When the commissioner, or person or persons appointed by him, shall determine that any tree or trees, shrubs, or other plants must be treated or destroyed forthwith, he may employ all necessary assistance for that purpose, and such person or persons, agent or agents, employé or employés may enter upon any or all premises necessary for the purpose of such treatment, removal, or destruction. But such commissioner, or the person representing him, shall, before such treatment or destruction, first require the owner or person in charge of such trees, shrubs, or plants to treat or destroy same, as the case may be, and upon the refusal or neglect upon the part of said owner or persons in charge to so treat or destroy such trees, plants, or shrubs, then such commissioner or person or persons representing him shall treat or destroy such trees, shrubs, or plants, and all reasonable charges and expenses thereof shall be paid by such owner or person in charge of said trees, shrubs, or plants, and shall constitute a legal claim against such owner or person in charge, which may be recovered in any court having jurisdiction, upon the suit of such commissioner or the county attorney of the county where the premises are situated, together with all costs, including an attorney fee of ten dollars, to be taxed as other costs.

SEC. 2. When such commissioner knows or has reason to believe that any such contagious disease exists, or that there is good reason to believe it exists, or danger is justly apprehended of its introduction in any locality in the State, or that any dangerously injurious insect pest exists within this State, and has reason to believe that danger may be justly apprehended from its existence, he shall forthwith send some competent person and such agent or agents as he may deem necessary to assist in extirpating said pest or pests, disease or diseases, and the said commissioner is hereby authorized and empowered to take such steps and do whatever may be deemed necessary to so control or prevent the spread, and to extirpate said pest or pests, disease or diseases, and he shall cause an examination to be made at least once each year prior to Novem-

ber first of each and every nursery or other place where trees, shrubs, or plants, commonly known as nursery stock, are grown for sale, for the purpose of ascertaining whether the trees, shrubs, or plants therein kept or propagated for sale are infected with any such contagious disease or diseases or infested with such pest or pests. If after such examination it is found that the said trees, shrubs, or other plants so examined are free in all respects from any contagious or infectious disease or diseases, dangerously injurious pest or pests, the said commissioner, or his duly authorized agent or other person designated to make such examination, shall, upon the payment of the fees hereafter provided, issue to the owner or proprietor of the said stock so examined a certificate setting forth the fact that the stock so examined is apparently free from any and all such disease or diseases, pest or pests. Should any nursery agent or dealer or broker send out or deliver within the State trees, vines, shrubs, plants, buds, or cuttings, commonly known as nursery stock, and which are subject to the attacks of insects and diseases above provided for, unless he has in his possession a copy of said certificate dated within a year thereof, deface or destroy such certificate, or wrongfully be in possession of such certificate, he shall be guilty of a misdemeanor, and upon conviction shall be punished by a fine of not less than one hundred dollars nor more than five hundred dollars. All nursery stock consigned for shipment or shipped by freight, express, or other means of transportation shall be accompanied by a copy of said certificate attached to each car, box, bale, bundle, or package. Any person selling or consigning for shipment, or shipping nursery stock as above, without such certificate attached, shall be guilty of a misdemeanor, and shall be punished by a fine of not less than one hundred dollars nor more than five hundred dollars. All trees, plants, shrubs, buds, or cuttings, commonly called nursery stock, grown in any nursery in this State in which San Jose scale has been found within two years of the date of the dissemination of said nursery stock, or grown in said nursery within one-half a mile of where said scale was found, and also all nursery stock from outside of this State disseminated or planted in this State, after the first day of November, 1905, must be fumigated with hydrocyanic gas in such manner as may be directed by the commissioner of this State. Such fumigation must be done by the grower, consignor, or consignee of such stock before planting, dissemination or reshipment, except such trees, shrubs, plants, buds, or cuttings grown in this State as are planted by the grower or propagator for himself, or such as from its nature or state of growth would be exempt; in such cases the commissioner shall declare such trees, shrubs, plants, buds, or cuttings free from such treatment. All nursery stock brought into this State from outside of this State must be accompanied by a certificate from the consignor that it has been fumigated as aforesaid. Whenever any trees, shrubs, plants, or other nursery stock are shipped into this State from another State, county, or province, every package thereof shall be plainly labeled on the outside with the name of the consignor, the name of the consignee, the contents, and, in addition to the certificate of fumigation above provided for, by a certificate showing that the contents have been inspected by a State or Government officer, and that the trees, shrubs, plants, or other nursery stock therein contained appear to be free from all injurious insects or diseases.

SEC. 3. Whenever any nursery stock is shipped into this State without such certificate, the fact shall be reported to said commissioner within twenty-four hours by the railroad, express, or other transportation company, or other person or persons carrying the same; and any agent of any such railroad, express, or other transportation company, or any person or persons who shall violate the provisions of this article shall be punished by a fine of not less than fifty nor more than two hundred dollars for each offense. The consignee or person re-

ceiving such stock shall, before selling, using, or disposing of same, fumigate such stock in accordance with the rules of said commissioner, with hydrocyanic gas, or procure a certificate from said commissioner that he has examined such stock and found the same to be apparently free from San Jose scale and other insect pests, and from all dangerously infectious diseases; and any one violating the provisions of this section shall be punished by a fine of not less than twenty-five dollars nor more than two hundred dollars. The words "nursery stock" wherever used in this article shall apply to and include all trees, shrubs, plants, or buds grown for nursery, basket, or other commercial purposes, or cuttings, whether grown in a nursery or elsewhere, so far as it relates to fumigation. The provisions of this and the preceding sections shall not apply to florists, greenhouse plants, flowers, or cuttings commonly known as greenhouse stock.

SEC. 4. Should any trees, shrubs, plants, or other nursery stock be shipped into this State under the certificate required in section 2 of this act without being first fumigated as required therein, or without having been inspected as required in section 2, or should it be made to appear that any such certificate is false, and that the nursery stock to which it relates is not free from insect pests or dangerous contagious diseases, such certificate shall be disregarded, and such trees, shrubs, plants, or nursery stock shall be held to have been shipped without such certificate as far as their sale, use, or disposition is concerned, and said commissioner shall when deemed necessary cause any trees, shrubs, plants, or other nursery stock shipped into this State from without the State to be examined, and where necessary have such trees fumigated or destroyed; and when it comes to the knowledge of said commissioner that any person, firm, or corporation is shipping into this State, or is about to ship any trees, plants, shrubs, or other nursery stock under a false certificate, such commissioner shall forbid such shipment and give warning to the public of same.

SEC. 5. The commissioner of agriculture, insurance, statistics, and history shall make such rules and regulations as may be deemed proper for carrying into effect this act, not inconsistent with same, and for the inspection of nurseries, and may call into service the State entomologist when not otherwise engaged, and also such other person or persons as may be necessary, and he shall fix and collect any reasonable fees for inspecting nurseries, to be paid by the person or persons for whom such inspection is made.

SEC. 6. If said commissioner or any of his agents or employes give a false certificate, or a certificate without an actual examination of the nursery stock for which such certificate is given, to any owner, proprietor, or lessee of any nursery, or to any other person for use under the provisions of this chapter, he shall be deemed guilty of a misdemeanor, and on conviction shall be punished by a fine of not less than five hundred dollars nor more than one thousand dollars for each offense.

SEC. 7. That the sum of one thousand dollars or so much thereof as may be necessary is hereby appropriated out of any funds in the State treasury not otherwise appropriated to carry out the provisions of this act.

SEC. 8. The fact that there is no law in this State to prevent the introduction, dissemination, and spread of San Jose scale and other dangerous insect pests and contagious dangerous diseases, and that the fruit industry, one of the most important in this State, is seriously menaced and threatened with irreparable loss and injury, creates an emergency, and an imperative public necessity requiring the constitutional rule requiring bills to be read on three several days be suspended, and is hereby suspended, and that this act take effect and be in force from and after its passage, and it is so enacted.

In effect now.

RULES AND REGULATIONS OF THE COMMISSIONER OF AGRICULTURE.

PESTS AND DISEASES DANGEROUS, INJURIOUS, OR DESTRUCTIVE.

(1) In accordance with section 1 of the above-cited act the following insect pests and fungous diseases are hereby declared injuriously infective and contagious; this list to be revised at the will of the commissioner of agriculture:

San Jose scale (*Aspidiotus perniciosus*).

Wooly aphid of apple (*Schizoneura lanigera*).

The new peach scale (*Diaspis pentagona*).

Mexican cotton boll weevil (*Anthonomus grandis*).

Citrus white fly (*Aleyrodes citri*).

Purple scale (*Mytilaspis citricola*).

Crown or root gall.

Yellows of peach.

Rosette peach and plum.

Black knot plum and cherry.

(2) The inspector is hereby charged by the commissioner of agriculture of Texas with the enforcement of said act, and as inspector is directed to locate by personal investigation, correspondence, and in such other manner as he may deem best the above-named pests, so far as they may exist in this State, and give such directions and take such steps in accordance with the above-cited act as he may deem proper and necessary to control or eradicate the same.

POWER OF COMMISSIONER OF AGRICULTURE, HIS AGENT OR AGENTS, TO DESTROY INFESTED PLANTS.

(3) In accordance with section 2 of the above-cited act, the inspector is hereby empowered to treat or condemn and destroy any infested trees, shrubs, or other plants when such infestation is or is likely to become a menace to the agricultural interests of any section of the State and when the owner or owners of infested premises shall refuse or neglect to properly execute the treatment prescribed for him or them after having been notified, as provided in section 1 of said act.

CERTIFICATE—HOW PROCURED.

(4) When a nursery has been inspected by the commissioner of agriculture, his agent or agents, and the inspection fee paid, a certificate will then be issued by the commissioner of agriculture, setting forth therein that the stock at the nursery and the premises of the person or persons for whom the inspection was made was carefully examined in compliance with the law, and that it was apparently free from dangerously injurious insects and contagious diseases; each and every certificate thus issued is good for one year from date thereof.

INSPECTION FEE.

(5) In accordance with section 5, empowering the commissioner of agriculture to fix and collect any reasonable fees for inspecting nurseries to be paid by the person or persons for whom such inspection is made a fee of \$5.00 per day and necessary traveling expenses is to be charged, and must be paid before such certificate, as provided for in rule 4, can be issued.

DISPOSITION OF INFESTED NURSERY STOCK BEARING CERTIFICATE.

(6) If any nursery stock shipped into the State of Texas under certificate required in section 3 is not free from insect pests or contagious diseases, the certificate shall be disregarded, and the nursery stock shall be held to have been shipped without certificate, and will be disposed of as provided for in section 4; and when it comes to the knowledge of the commissioner of agriculture that any person, firm, or corporation is shipping into this State, or is about to ship, any trees, plants, shrubs, or other nursery stock under false certificate, such commissioner shall forbid such shipments and give warning to the public of the same.

NURSERYMEN TO APPLY FOR INSPECTION BEFORE JULY 1.

(7) Persons or firms in the State of Texas growing for sale trees, cuttings, shrubs, vines, or other plants commonly known as nursery stock shall make application to the commissioner of agriculture for inspection and certificate on or before the 1st of July of each year, except for year 1905; application for this year on or before August 15th. Any person, corporation, or firm failing to make application to have his or their stock inspected as aforesaid after receipt of notice of this rule shall not be permitted to offer for sale in this State any of said stock not inspected: *Provided*, That such person, corporation, or firm may make written application to the commissioner of agriculture to be relieved of his or their default and consequences, and offering to pay any additional expense incurred by the State and its officers by reason of such failure. The commissioner of agriculture may, upon a proper showing, order an inspection of said nursery.

OFFICIAL CERTIFICATE AND TAGS—HOW SECURED OUT OF THE STATE.

(8) Any person or persons residing in States or countries outside of the State of Texas, dealing in or handling shrubs, trees, or other plants in this State, or shipping trees, shrubs, or other plants therein, shall file with the commissioner of agriculture of Texas a certified copy (or a signed duplicate of original) of the certificate issued by the entomologist, fruit inspector, or other duly authorized official of the State or country in which said stock was grown. Such certificate for nurseries south of the northern boundary line of North Carolina, Tennessee, and Arkansas must be based upon an inspection made not earlier than July 1st, and for nurseries north of said line upon an inspection made not earlier than June 1st.

COMMON CARRIERS MUST REPORT UNCERTIFIED STOCK. PENALTY FOR NEGLECT.

(9) Any nursery stock shipped into the State of Texas without certificate as provided for in section 3 shall be reported to the commissioner of agriculture within 24 hours by the railroad, express, or other transportation company or other person or persons carrying the same. Any agent of any such railroad, express, or other transportation company, or any person or persons who shall violate the provisions of this act, shall be punished by a fine of not less than \$50.00 nor more than \$200.00 for each offense.

DISPOSING OF UNCERTIFIED STOCK BY CONSIGNEE. PENALTY FOR NEGLECT.

(10) The consignee or person receiving uncertified nursery stock shall, before selling, using, or disposing of same, fumigate such stock, in accordance with

the rules and directions of the commissioner of agriculture, with hydrocyanic acid gas, or procure a certificate from said commissioner that he had examined such stock and found the same to be apparently free from dangerously injurious insect pests and infectious diseases; any one violating the provisions of this section shall be punished by a fine of not less than \$25.00 nor more than \$200.00. (In effect November 1st, 1905, and after.) See section 3 of this act.

(11) The words "nursery stock" wherever used in connection with this act shall apply to and include all trees, shrubs, plants, cuttings, or buds grown for nursery, basket, or other commercial purposes, or cuttings, whether grown in a nursery or elsewhere, so far as it relates to fumigation. The provisions of this and Rule 10 shall not apply to florists, greenhouse plants, flowers, or cuttings, commonly known as greenhouse stock.

WHAT STOCK TO FUMIGATE.

(12) All trees, shrubs, or plants commonly known as nursery stock, with the exception of conifers, offered for sale, sold, or given away in this State shall be fumigated with hydrocyanic acid gas by the grower, under the direction of the commissioner of agriculture, provided that the San Jose scale has been found within two years of the date of the dissemination of the said nursery stock, or grown in said nursery within one-half mile of where said scale was found. Upon failure of any grower or growers to comply with this requirement, certificate shall be withheld or canceled and the case disposed of as provided in section 1 of said act.

APPEALS FROM DECISION OF INSPECTOR.

(13) Appeals from the decision of the inspector or agent shall be addressed to the commissioner of agriculture within three days from the service of the notice of such decision, and said commissioner will notify the appellant of the time and place of hearing such appeal. The decision of the commissioner of agriculture shall be final.

UTAH.

CHAPTER 98, SESSION LAWS OF 1905.

AN ACT creating a State board of horticulture, providing for county fruit-tree inspectors, defining their duties, providing for the publication and distribution of their reports, defining the duties of orchardists and nurserymen, and repealing chapter 104, laws of Utah, 1903.

Be it enacted by the legislature of the State of Utah:

SECTION 1. A State board of horticulture is hereby created consisting of five members, one of whom shall be the director of the Utah Agricultural College Experiment Station, and the other four shall be appointed by the governor, by and with the consent of the senate, one from each of the four horticultural districts, which are hereby constituted as follows:

First. The counties of Boxelder, Cache, Rich, Morgan, and Weber shall be known as district No. 1.

Second. The counties of Davis, Salt Lake, Tooele, Summit, and Wasatch shall be known as district No. 2.

Third. The counties of Utah, Juab, Carbon, Emery, Uintah, San Juan, Grand, Sanpete, and Sevier shall be known as district No. 3.

Fourth. The counties of Millard, Beaver, Piute, Wayne, Iron, Garfield, Kane, and Washington shall be known as district No. 4.

SEC. 2. Upon approval of this act the governor shall appoint four members, no more than three of whom shall belong to one political party, and their term of office shall be four years and until their successors are appointed and qualified. The members appointed from each district shall be residents of the district from which they are appointed and shall be specially qualified by practical experience and study in connection with the industries dependent upon horticulture. Their term of office shall begin within 30 days after appointment.

SEC. 3. Said board shall have an office at the State capital, which shall be maintained at the expense of the State, and within 30 days after their appointment they shall meet and organize by electing a president and secretary from their number. The State treasurer shall be ex officio treasurer of the board.

SEC. 4. The board shall meet semiannually, and as much oftener and at such places as it may deem expedient, to consult and adopt such measures as may best promote the horticultural industries of the State. It may hold institutes and horticultural meetings, and may appoint competent and qualified persons to lecture in each of the horticultural districts named in section 1 of this act for the purpose of illustrating practical horticultural topics and imparting instruction in the methods of culture, pruning, fertilizing, and also in the best methods of treating the diseases of fruit and fruit trees, etc., cleansing orchards, and exterminating insect and other pests. They shall also confer with and instruct the county fruit-tree inspectors provided for herein in relation to their duties, as occasion may require, and shall have general supervision over the enforcement of the provisions of this act.

SEC. 5. The secretary, besides being a practical horticulturist, shall be especially qualified for his office by experience and education to compile and correct reports and essays, to present in a logical order all the information to be published by the board. It shall be his duty to attend all meetings of the board and to prepare and preserve all reports of its proceedings and correspondence, to collect books, pamphlets, and periodicals and other documents containing information relating to horticulture and to preserve the same, to collect statistics and other information showing the actual condition and progress of horticulture in this State and elsewhere, and prepare, as required by the board, reports for publication, and shall distribute by mail or otherwise the bulletins, reports, and other publications of the board to the fruit growers of the State and others who may request them, and to perform all such other duties as may be prescribed by the board.

SEC. 6. The compensation of each appointed member of the State board of horticulture shall be \$400 per annum, excepting the member designated to act as secretary, provided for herein, who shall receive as compensation the sum of \$1,200 per annum, who shall devote all his time and attention to the board and shall not be engaged in any other business. In addition to such compensation each member of the board shall receive the amount of his actual and necessary traveling expenses when on official business. The salaries and other expenses as provided herein shall be paid as provided in case of other State officers: *Provided*, That before entering upon the discharge of his official duties each member shall make and subscribe to the constitutional oath of office.

SEC. 7. The office of the board shall be in charge of the secretary and shall be open for the transaction of business each day during the year, excepting Sundays and legal holidays and excepting such time as the secretary of the board may be in the active discharge of his duties outside of said office: *Provided*, That the necessary office expenses shall be paid from the funds herein-after appropriated as other expenses are paid.

SEC. 8. The State treasurer is hereby authorized to receive gifts, donations, or bequests of money or property for the promotion of the horticultural interests of Utah and to disburse the same upon the warrants of the State auditor, which said warrants shall be drawn only upon order of the majority of said board of horticultural commissioners and for the purpose named in this title.

SEC. 9. The State board of horticulture is hereby vested with all necessary authority to enforce quarantine against any infested fields, lots, orchards, nurseries, trees, plants, shrubs, vines, buds or scions, fruits, or any place or articles within the State when the same may be liable to spread contagious diseases injurious to fruit or trees, or fruit crops of any kind, and to provide necessary rules and regulations to govern the same.

SEC. 10. For the purpose of preventing the introduction into the State or spread of contagious diseases, insect pests, or fungus growth among fruit, shade, and ornamental trees, and for the prevention, treatment, cure, and extirpation of fruit and tree pests and diseases of fruit, and fruit, shade, and ornamental trees, and for the disinfection of grafts, scions, orchard débris, fruit boxes, and packages, and other material or transportable articles harbouring or containing infectious diseases or insect pests dangerous to orchards, fruit, or trees of any kind, said board shall make regulations for the quarantining and disinfection thereof, which said regulations shall be circulated by the board in printed form among the fruit growers, fruit dealers, and nurserymen of the State, by publishing the same at least four successive times in some newspaper having a general circulation in the State, and by posting copies thereof in three conspicuous places in each county, one of which shall be at the county court-house. Such regulations, when so circulated and promulgated, shall be held to impart notice of their contents to all persons within the State and shall be binding upon them. A wilful violation or violation by neglect of any quarantine or other regulation of said board necessary to prevent the spread and introduction into the State of fruit or tree diseases or insect pests, or the shipment, sale, or distribution of any article so infected as to be dangerous to the fruit-growing interests of the State, or the spread of dangerous diseases among trees or orchards, shall be deemed a misdemeanor.

SEC. 11. For the purpose of disseminating knowledge concerning contagious diseases or injurious pests affecting trees, plants, vines, or fruit, and the remedies, preventives, and disinfectants applicable thereto, the board shall from time to time, as it may deem necessary, have bulletins printed containing such information, remedies, preventatives, and disinfectants as it may approve, together with the rules and regulations formulated by it in accordance with section 10 of this act; which bulletins shall be circulated among the fruit growers, fruit dealers, shippers, transportation companies of horticultural products and their agents within the State.

SEC. 12. Within 30 days after this law goes into effect, the board of county commissioners of the several counties shall appoint one horticultural inspector and as many deputies as deemed necessary to carry out the provisions of this act; said inspectors and their deputies shall be competent, experienced, and practical horticulturists. Such inspectors shall hold office for a term of two years, and until their successors are appointed and qualified, unless sooner removed for cause. They shall qualify by taking and subscribing the constitutional oath, which shall be filed with the county clerk; said inspectors shall be paid out of the county treasury for the time and services actually rendered, at such rate per day as the board of county commissioners shall fix, not to exceed \$3 per day for inspectors, and \$2 for deputies, with reasonable transportation expenses. The county inspector or inspectors shall carry out the provisions of

this act and the regulations of the State board of horticulture, and perform such other labors as the county commissioners may direct for the extirpation of fruit and other pests and diseases: *Provided*, That it shall not be lawful to spray with any arsenical or other poisonous material any tree or shrub when the same is in bloom: *Provided further*, That in the event of any county inspector failing or refusing to properly perform his duties, nothing in this act shall be construed to prevent the member of the State board of horticulture for the district in which such county inspector may be derelict from enforcing in said county the provisions of this act and the rules and regulations of the State board of horticulture.

SEC. 13. The county fruit-tree inspector, or his deputies in each county, shall make an inspection of every orchard, nursery, vineyard, and fruit packing or cold storage house, storeroom, or sales room, warehouse, or any other place, or article connected with horticulture within their jurisdiction at least once every year, and as much oftener as may be deemed necessary for the protection of the fruit interests of the county, and if found infected with pests or diseases injurious to fruit or fruit trees, vines, shrubs, plants, ornamental or shade trees, they shall notify the owner or owners, person or persons, in charge or possession of the fruit, trees, vines, shrubs, or places or articles as aforesaid that the same, or any of them, are infected with disease, insects, or their eggs or larvæ, and they shall require such persons to remove or disinfect the same and make application of such treatment for the purpose of destroying them as prescribed by the State board of horticulture, within a certain time, to be specified in said notice. Said notice may be served upon the person or persons owning or having charge of such infested trees, fruits, or places or articles aforesaid by any inspector, or they may be served the same as a summons in a civil action. If the owner or owners, person or persons, in charge or possession of orchards or nursery trees, ornamental or shade trees, fruits, places, or articles infected with said diseases, insects, or any of them, their larvæ, or eggs, after having been notified as above by said inspector to destroy the same or make application of treatment as directed, shall fail, neglect, or refuse so to do, they shall be deemed guilty of maintaining a public nuisance and shall be punished by fine, not less than five nor more than one hundred dollars, and any such orchards, nurseries, trees, or places or articles thus infected, shall be adjudged, and the same is hereby, declared a public nuisance, and shall be punished by fine, not less than five nor more than one hundred dollars: and any such orchards, nurseries, trees, or places or articles thus infected shall be adjudged, and the same is hereby declared a public nuisance and shall be proceeded against as such. It shall be the duty of the county inspector in whose county said nuisance shall exist to cause such nuisance to be abated at once by eradicating or destroying said disease, insects, or pests, or their larvæ or eggs, by treating or disinfecting the infected or diseased fruit trees, plants, places or articles as aforesaid, and the costs thereof shall be assessed against the owner or owners, person or persons, in charge of said property or premises, and if not paid within 10 days from demand the said expense shall become a county charge and the board of county commissioners shall allow and pay the same out of the general fund of the county. Any and all sums so paid shall be and become a lien on the property and premises from which said nuisance has been removed or abated in pursuance of this act and may be recovered by an action against the owner or owners of such property or premises: *Provided*, That all formulas for disinfection or eradication of said diseases or insect pests shall be as prescribed by the State board of horticulture, but the time and place of application shall be left to the discretion of the county inspectors.

SEC. 14. For the extirpation of serious, noncurable tree diseases, such as pear blight, crown gall, peach yellows, peach rosette, upon discovery of said diseases the county fruit-tree inspector shall notify the owner or owners, person or persons in charge or possession of said trees or shrubs, of such fact, and shall require such persons to extirpate the said disease by destroying the affected trees or shrubs by burning within a certain time, to be specified in said notice, said notice to be served upon the person or persons owning or having charge of such infected trees as aforesaid by any inspector, or they may be served the same as a summons in a civil action. If the owner or owners, person or persons in charge or possession of said trees or shrubs, after having been notified as above by said inspector to destroy the same as directed, shall fail, neglect, or refuse so to do, they shall be deemed guilty of maintaining a public nuisance, and the case shall be reported to the county attorney, who shall file a complaint, and it shall be speedily adjudicated; and if charges are found correct the court shall order the same destroyed or removed, the costs to be paid within ten days by the owner or person in charge; if not, it shall be paid by the county, and it shall be collected by the county attorney, with costs, and paid into the county treasury.

SEC. 15. The county inspector shall make monthly reports to the county commissioners and to the secretary of the State board of horticulture on forms prescribed by the said board. Said reports shall embrace the labors of the county inspector and his deputies for the month and statistics showing the general condition of horticulture within the county, together with such statement of facts and recommendations as he may deem useful to the horticultural interests of the county. The secretary of the State board shall make a biennial report to the secretary of state the first day of December preceding the meeting of the State legislature, and the secretary of state shall cause 5,000 copies of the same to be published in a pamphlet or book form for distribution as other State publications.

SEC. 16. It shall be the duty of every owner, possessor, or occupier of any orchards, nursery, garden lot, or land where fruit trees are grown within this State to remove from said land and destroy by burning all diseased or decayed branches of fruit trees affected with pear blight and to burn and destroy all dead trees and trees affected with peach rosette or peach yellows.

SEC. 17. It shall not be lawful for any nurseryman, corporation, or private individual to import into this State or to ship in the State any trees, shrubs, or vines, unless the same are properly certified to by a professor of entomology of a Government experiment station, or an officer of a State board of horticulture or a regular examiner and appointed county inspector, operating in the regular discharge of their duties, as having been fumigated or disinfected by hydrocyanic acid gas before shipment. Importations of trees or shrubs unaccompanied by such certificate of fumigation shall be held in quarantine at owner's risk until so fumigated, at the cost of the importer. Said fumigation shall be made to the satisfaction of the county fruit-tree inspector or of the member for that district of the State board of horticulture.

SEC. 18. It shall be the duty of any and all owners of any nursery or nurseries or nursery stock to disinfect by the use of hydrocyanic gas all their nursery stock for the destruction of insects or diseases injurious to fruit trees or shrubs before removing the same, or any of it, from their premises for sale, gift, distribution, or transportation.

SEC. 19. The State board of horticulture shall have power to authorize the holding of State horticultural exhibitions, and shall determine the time and place for holding said exhibitions, with power to arrange for premiums and

awards, and perform such other duties as may be necessary in conducting such exhibitions.

SEC. 20. For the purpose of carrying out the provisions of this act, \$8,000 is hereby appropriated out of any money in the State treasury not otherwise appropriated; \$4,000, or so much thereof as may be necessary, to be paid in the year 1905 and \$4,000 in the year 1906.

SEC. 21. That chapter 104 of the session laws of Utah, 1903, is hereby repealed.

SEC. 22. This act shall take effect upon approval.

Approved March 9, 1905.

RULES, FORMULAS, AND RECOMMENDATIONS PROMULGATED BY THE STATE BOARD OF HORTICULTURE.

RULE 1. It shall be the duty of every owner, possessor, or occupant of an orchard or land where trees, vines, or shrubs are grown within this State to remove from said land and destroy by burning all diseased or decayed branches or trees, rubbish, and debris harboring insects or fungous growth, and to keep their orchards clean of all decayed and fallen fruit.

RULE 2. The owner or owners of any nursery or nurseries shall disinfect all their nursery stock before the removal of the same from their premises for sale, gift, distribution, or transportation by the use of hydrocyanic acid gas, as given in Formula No. 4.

RULE 3. Importations of trees or shrubs, and shipments of home-grown nursery stock unaccompanied by a certificate of fumigation as required by rule 2, shall be held in quarantine at owner's risk until so fumigated at the cost of the importer or grower. Said fumigation shall be made to the satisfaction of the county horticultural inspector or of the member for that district of the State board of horticulture.

NOTE.—Rules 2 and 3 are promulgated because of the undoubted fact that scale insects may infest nursery stock and still escape any inspection that it is practicable to make.

RULE 4. Any member of the State board of horticulture, or county horticultural inspector, may give a certificate stating that any nursery stock within his district or county has been fumigated with hydrocyanic acid gas when it shall be proved to the satisfaction of such officer that said stock has been so treated; but no certificate shall be given by any officer stating that any nursery stock is free from insects or diseases.

RULE 5. It shall be the duty of each county horticultural inspector to examine all nursery stock received in his county or district and see that it is accompanied by a certificate of fumigation as required by sections 17 and 18 of the State horticultural law (chapter 98, Session Laws of Utah, 1905).

RULE 6. All importations or shipments of trees, shrubs, or vines shall be inspected for crown or root gall and pear blight, and all such infected trees, shrubs, or vines shall be destroyed by burning.

RULE 7. It shall be the duty of every owner or possessor of any trees, shrubs, or vines found to be infested with any injurious insects or infected with fungus or other diseases to disinfect the same by spraying or other treatment as provided hereinafter.

RULE 8. All trees, shrubs, or vines found to be infested with the San Jose scale shall be treated as hereinafter provided. (Kerosene emulsion, double strength, in summer, and lime-sulphur mixture as a winter spray.)

RULE 9. Any and all fruit trees, whether in orchard or nursery, within the State found to be infected with diseases known as peach yellows or peach rosette or crown gall shall be destroyed by burning as soon as such diseases may be determined to exist. Destruction of such infected trees shall be carried out upon the order of any member of the State board of horticulture or of any county horticultural inspector, as provided by the horticultural law of Utah.

RULE 10. It shall be the duty of every owner or possessor of any orchard found to be infected with the disease known as pear blight or fire blight to disinfect the same by cutting out and burning all affected branches, and the whole tree, if badly infected. Limbs should be cut off a foot below the part affected. The knife and saw used in cutting out the diseased limb must be disinfected with kerosene or a 5 per cent solution of carbolic acid, and in addition the stub remaining on the tree should be disinfected with the same material, to prevent the further spread of the disease. The pear blight is a most pernicious and discouraging disease, for which no remedy has thus far been discovered, and the board suggests that it will be more economical to take out all badly affected trees, both root and branch, than to try to save them by pruning.

RULE 11. It shall be the duty of the county horticultural inspector to see that the provisions of these regulations and of the horticultural law are put in force and effect within his jurisdiction.

RULE 12. Disinfection as provided by these regulations shall be to the satisfaction of the county horticultural inspector or of the member of the State horticultural board having jurisdiction.

RULE 13. To make effective the horticultural law of the State and the regulations of the board of horticulture respecting importations and shipments of nursery stock it shall be the duty of express and transportation companies or their agents to at once report the arrival of any shipment of nursery stock to the county horticultural inspector having jurisdiction, either by mail or telephone, to give this officer opportunity to make any necessary inspection, as required in rules 5 and 6, and shall hold the stock in quarantine till such inspection is made: *Provided*, That no shipment of nursery stock shall be held longer than 24 hours after notice of its arrival has been sent to the county horticultural inspector.

Adopted in regular meeting of the board of horticulture, held in Salt Lake City, April, 1905.

VERMONT.

There is no law in Vermont relating to the control of injurious insects.

VIRGINIA.

AN ACT to amend and reenact an act entitled "An act to create and maintain a State board of crop pest commissioners, and to define its duties and powers," approved March 5, 1900.

1. *Be it enacted by the general assembly of Virginia*, That an act entitled "An act to create and maintain a State board of crop pest commissioners, and to define its duties and powers," approved March fifth, nineteen hundred, be amended and reenacted so as to read as follows:

SECTION 1. The board of control of the Virginia agricultural experiment station is hereby created a State board of crop pest commissioners, with power and

duties as hereinafter provided. It shall be the duty of the said board to appoint a competent person as State entomologist and plant pathologist, hereinafter called State entomologist, and such assistants as may be necessary, who shall, acting under the authority of the said board, be charged with and perform such duties as are hereinafter specified. The board of crop pest commissioners shall from time to time, after due consideration, prepare a list of such dangerously injurious insect pest and diseases of plants as may properly, within its judgment and the judgment of the State entomologist, be controlled or eradicated, and they shall cause such list to be published, along with particular specification as to the nature and appearance of and the manner in which the said pests are generally disseminated. The board of crop pest commissioners shall at the same time provide rules and regulations under which the State entomologist shall proceed to investigate, control, eradicate, and prevent the dissemination of the said pests as far as may be possible, and these rules and regulations shall have the full force and effect of law so far as they conform to this act and the general laws of this State and of the United States; and any person, firm, or corporation who fails or refuses to comply with the order or directions issued in writing, under regulations provided by the board of crop pest commissioners, shall, upon conviction thereof, be fined in the sum of not less than ten (\$10.00) nor more than twenty-five (\$25.00) dollars for each such failure or refusal: *Provided*, That all prosecution under this act shall be by indictment, presentment, or information in the circuit court of the county or corporation court of the city in which the person, firm, or corporation proceeded against is then resident.

SEC. 2. The board of crop pest commissioners shall have power to provide quarantine rules and regulations concerning the sale and transportation of all plants or parts of plants, commonly known as nursery stock, within the State. They shall also have power to provide like rules and regulations in regard to all plants or parts of plants, commonly known as nursery stock, entering this State from without, and these rules and regulations shall be enforced by the State entomologist or his duly authorized assistants.

SEC. 3. It shall be the duty of this board to provide for the annual inspection of all nursery stock grown within the State prior to October first of each year, by the State entomologist or his assistants, who shall issue a certificate of freedom from insect pests and plant diseases to the owners of all nurseries found entitled to the same, and they shall further provide regulations under which nursery stock brought into the State may be sold under the above-provided certificates, and in accordance with the further provisions of this act. It shall be unlawful after the promulgation of the rules and regulations provided for in this act for any person, persons, corporation, or common carriers to transport by land or water plants or parts of plants, commonly known as nursery stock, in violation of the same, and every such offence shall constitute a misdemeanor, and, upon conviction thereof, the person, persons, firm, or corporation, or common carrier so convicted shall be fined in the sum of not less than fifty (\$50) dollars nor more than one hundred (\$100) dollars for each and every violation of this act.

SEC. 4. The State entomologist or any of his assistants, or a local inspector as hereinafter provided for, shall have power under the rules and regulations of said board to determine the nature and method of the treatment to which any infested plants shall be subjected, and he shall report his findings in print or writing, giving reasons therefor, to the owner of the infested plants, his agents or tenants, and a copy of such report shall be submitted to said board, and there shall accompany each and every such report specific directions as to the treat-

ment of the infested plants, which directions may be in print or in writing. In case of objection to the findings of the State entomologist, or an assistant or local inspector, an appeal shall lie to the said board, whose decision shall be final; such appeal must be taken within seven days from the receipt of the report, and shall act as a stay of proceedings until it is heard and decided.

SEC. 5. Upon the receipt of the report of the State entomologist, an assistant, or local inspector, the treatment prescribed shall be executed at once (unless an appeal is taken) under the supervision of the local inspector, the cost of material and labor to be borne by the owner of the premises.

SEC. 6. In case any person, firm, or corporation fail or refuse to execute the directions of the State entomologist, an assistant, or local inspector, or of the said board after an appeal, the judge of the circuit court of the county or corporation court of the city in which such person, firm, or corporation are then residents shall, upon complaint filed by the State entomologist, or an assistant or local inspector, or by any freeholder, cite the person, firm, or corporation to appear before him at the first regular session of the circuit or corporation court or in vacation, and upon satisfactory evidence of such failure or refusal shall cause the prescribed treatment to be executed, and the expense thereof and cost of court shall be collected by execution from the owner or owners of the infested plants, and any judgment of the court entered against any person, persons, firm, or corporation in any such cause shall be a lien upon all real estate owned in whole or in part by any such person, persons, firm, or corporation.

SEC. 7. The said board of crop pest commissioners, its agents or employees, are hereby empowered with authority to enter upon any premises and to examine all plants and trees whatsoever in discharge of the duties herein prescribed. Any person, persons, firm, or corporation who shall obstruct or hinder them or their agents in the discharge of their duty shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than twenty (\$20.00) dollars nor more than fifty (\$50.00) dollars for each such offence.

SEC. 8. It shall be unlawful to deliver or give away within the boundaries of this State plants or parts of plants commonly known as nursery stock which have not been duly inspected in accordance with the provision of this act and carry plainly attached to each car load, box, bail, and package a copy of a certificate as herein provided, except that in case of nursery stock shipped into the State from without, the board of crop pest commissioners shall provide by regulation for the acceptance of proper certificates from other States, and when so accepted shall issue an official tag designating the fact, and nursery stock carrying the same may be reshipped under the certificate above provided for.

Each and every violation of this section shall constitute a misdemeanor, and upon conviction thereof every person, persons, firm, or corporation so convicted shall be fined in a sum of not less than twenty-five (\$25.00) dollars nor more than fifty (\$50.00) dollars. This section shall not be so construed as to affect the action of common carriers in the transportation of nursery stock under the provisions of interstate commerce.

SEC. 9. Upon a petition signed by ten freeholders of any city, county, or magisterial district, it shall be the duty of the State entomologist, in person or by an assistant, to make a preliminary investigation of the locality from which the petition is received, to ascertain if any trees or plants be infested with the insect known as the San Jose scale. If, upon such preliminary investigation, it shall appear that the San Jose scale is present in the territory examined, the State entomologist shall appoint a local inspector, and order a full inspection of such city, county, or magisterial district to discover and locate all infested premises; and the local inspector shall report the results of such further inspec-

tion to the owners of all infested premises, and to the board of supervisors of the said county or the city council of said city, giving the location of all said infested trees and plants, and the extent of infestation in each case, and make specific recommendations in accordance with the instructions furnished him by the State entomologist, which instructions may be printed or written.

SEC. 10. The board of supervisors of any county or city council of any city in which a local inspector has been appointed shall fix the compensation of such local inspector, whose pay, however, shall not in any case be less than one dollar and fifty cents for each day's work, and said local inspector shall file before the said board of supervisors or city council from time to time an itemized account of the expenses and costs incurred in the performance of his duties, and a statement of the days actually occupied in the performance of the duties hereinbefore prescribed, and the same shall be allowed him and paid as other claims against the county or city, not to exceed two hundred and fifty dollars in any one year. But the board of supervisors of any county or the council of any city may appropriate any sum in excess of two hundred and fifty dollars which it may deem proper. The sum appropriated in any year in excess of the actual requirements of such year shall not be considered as an appropriation for any subsequent year.

SEC. 11. It shall be the duty of the State entomologist, either in person or by an assistant or local inspector, to supervise and direct the execution of any recommendations made under the provisions of section two of this act, and all expenses of treatment, control, and eradication of any infested trees or plants shall be borne by the owner of the premises upon which the same are located, as provided for in sections four and five of this act.

SEC. 12. From and after the first day of September, nineteen hundred and three, it shall be unlawful for any person, persons, firm, or corporation, either for himself or as agent for another, to offer for sale, sell, deliver, or give away, within the bounds of this State, any plants or parts of plants commonly known as nursery stock, unless such person, persons, firm, or corporation shall have first procured from the auditor of public accounts a certificate of registration, which certificate shall contain such rules and regulations concerning the sale of nursery stock as the board of crop pest commissioners may prescribe and be approved and countersigned by the State entomologist, who shall have full power and is hereby authorized and required to cancel and withdraw any certificate upon satisfactory evidence that any of the rules and regulations governing the sale of nursery stock within this State have been violated by the holder of the same. The auditor of public accounts shall not issue any certificate of registration except upon the payment of the sum of twenty dollars, and shall forward all certificates to the State entomologist for his approval before allowing the same to the party making application therefor, and all such certificates as may be granted shall expire and become null and void one year from date of issue thereof, and any person, persons, firm, or corporation, either for himself or as an agent for another, who shall sell, offer for sale, deliver, or give away any plants or parts of plants commonly known as nursery stock without having in his possession a certificate of registration as herein provided for, or without exhibiting a copy of the same to each and every person to whom he shall sell or offer to sell, deliver, or give away any such plants, or parts of plants, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than twenty (\$20.00) dollars nor more than one hundred (\$100.00) dollars for each such offence.

SEC. 13. The auditor of public accounts shall set aside and reserve all moneys coming into his hands in pursuance of the provisions of section twelve of this

act, and shall from time to time draw his warrant for the same in favor of the State entomologist in payment for services and expenses incurred in the inspection of the various nurseries in this State, and the inspection of nursery plants sold by agents representing nurseries from without this State.

SEC. 14. There is hereby appropriated from any moneys in the State treasury not otherwise appropriated the sum of six thousand (\$6,000.00) dollars per annum for the purpose of defraying the expenses of the execution of this act, and the auditor of public accounts of the Commonwealth is hereby directed to draw his warrant upon the treasury of the same for this sum or such part thereof as may be necessary until the said sum of six thousand (\$6,000.00), dollars per annum be expended, upon the filing with him of properly itemized vouchers certified by the chairman of said board of crop pest commissioners. The said board shall cause to be made a biennial report to the governor of the State, giving in detail its operation and expenditures under this act.

2. The acts of assembly known as the San Jose scale law, approved March fifth, eighteen hundred and ninety-six, and amended and approved February twenty-eighth, eighteen hundred and ninety-eight, and as further amended by an act approved March twenty-eighth, nineteen hundred and two, and all other acts and parts of acts inconsistent with this act are hereby repealed.

3. This act shall be in force from its passage.

Approved May 9, 1903.

RULES AND REGULATIONS FOR THE GOVERNMENT OF THE STATE ENTOMOLOGIST, ASSISTANTS, LOCAL INSPECTORS, AND EMPLOYEES OF THE STATE BOARD OF CROP PEST COMMISSIONERS, AS AUTHORIZED BY ACT OF ASSEMBLY APPROVED MAY 9, 1903.

1. By virtue of authority conferred by the above-cited act, the following rules and regulations are hereby adopted and promulgated by the State board of crop pest commissioners, and the State entomologist and pathologist and such assistants and local inspectors as may be hereafter appointed are authorized and directed to enforce the same.

2. *List of insects and fungous parasites.* The following list of insect pests and plant diseases are hereby declared to be dangerously injurious, and it is ordered by this board that they shall hereafter come within the scope of operations under the crop-pest law :

Insects.—San Jose scale (*Aspidiotus perniciosus*). Woolly aphis (*Schizoneura lanigera*), in nurseries only.

Fungi.—Crown gall, in nurseries only. Peach yellows. Black knot of plum and cherry (*Plowrightia morbosa*). Fire blight of pear and apple (*Micrococcus amylovorus*) in nurseries only.

This board reserves the right to alter, amend, and change this list as the exigencies of the work may warrant.

3. *Quarantine against diseased nursery stock.* It is hereby declared that dating from September 1st, 1903, no person, persons, firm, or corporation owning or operating a nursery within the State of Virginia shall sell, transport, or give away any fruit trees, or other plants commonly known as nursery stock, when infested with the San Jose scale, woolly aphis, crown gall, peach yellows, black knot of the plum and cherry, or fire blight of pear, as specified under section 2 above.

4. *Dealing with peach yellows and black knot in orchards.* It is hereby declared that peach yellows and black knot of plum and cherry are of such a

communicable character that wherever discovered in orchards in this State they shall be destroyed or treated within a reasonable time in accordance with the directions of the State entomologist, assistants, or local inspectors, acting under orders of this board.

5. *Infested nursery premises—how dealt with.* Any nursery premises within this State which shall upon inspection prove to be infested with any one or more of the insect pests or plant diseases specified in section 2, shall not be entitled to a certificate of freedom from disease and insect pests until they shall have satisfactorily carried out the directions of the State entomologist or an assistant acting under orders of this board.

Every person, persons, firm, or corporation doing business in this State as growers or handlers of nursery stock are hereby notified that they must not sell, transport, or give away the same unless accompanied by a certificate of inspection from the State entomologist, or an assistant acting under the orders of this board, declaring the same to be apparently free from San Jose scale and other dangerously injurious insect pests and plant diseases.

6. *On the certification of nursery stock from other States.* All nursery stock entering this State from without must be accompanied by a certificate of inspection, satisfactory to the State entomologist, both as to form and the authority of the person making the same, which certificate shall certify substantially as above required in case of State nurseries. As a guide to transportation companies, as to whether a certificate is valid or not under this law, the State entomologist shall furnish to all nurserymen in other States doing business in this State, official tags upon request, if the certificate of inspection of the party or parties applying for the same is found to be correct and in proper form, and the said parties shall have procured the State certificate of registration as required in section 12 of the act of assembly. These tags shall be charged for at cost.

7. *Regulating the transportation of nursery stock.* All transportation companies doing business in this State, both by land and water routes, are hereby notified that on and after September 1st, 1903, they must not, under penalty prescribed in section 3 of above act, transport plants, commonly known as nursery stock, within the bounds of this State, to be delivered at any point therein, except the same are accompanied by, and have plainly attached thereto, a certificate as provided for in section 8 of these rules, and in case of nursery stock entering this State from without for delivery in the State, such nursery stock must carry in addition to the official certificate of the State whence the shipment originated, the official tag of the State entomologist of Virginia, as specified in section 6 above.

8. *The inspection and certification of nurseries.* It shall be the duty of the State entomologist, or an assistant appointed by this board, to inspect all nursery premises in this State at least once each year, and issue to each a certificate in proper form if found entitled to the same. On the discovery of any infested nursery, the State entomologist shall pursue such methods as are necessary to eradicate the injurious insects and plant diseases specified in section 2 of these rules and regulations, and when accomplished a certificate shall be issued in due form. Certificates of nursery inspection shall in all cases be signed by the State entomologist, or by an assistant authorized by the board of crop pest commissioners. The State entomologist is hereby authorized to grant special certificates to dealers in nursery plants, upon satisfactory evidence that they are handling only properly inspected stock.

9. *Resale by nurserymen of certified stock.* All nursery stock purchased outside the State and brought into this State for resale by a duly authorized nurseryman may be sold under the official certificate of the State entomologist, or

that of an assistant appointed by this board, if the said nursery stock was purchased under the official tag specified in section 6 of these rules and regulations, but this regulation shall not operate to prevent reinspection of all such stock at the discretion of the State entomologist, and condemnation of the same if found infested with any of the insect pests or plant diseases specified in section 2 above.

10. *As to local inspection for the San Jose scale.* The State entomologist is hereby directed to furnish to the authorities of each city and county, as promptly as may be, a full statement of the conditions prevailing in the several cities and counties of the State as shown by the records of the State board of crop pest commissioners, in relation to the infestation of orchards and gardens with San Jose scale. And he is also directed to furnish the same statement to all interested individuals in the several cities and counties of the State who may apply therefor, to the end that those who are concerned in the protection of the fruit industry from the ravages of this insect pest may take such action under the provisions of the crop pest law as they deem necessary. When a sufficient number of the freeholders of any city, county, or magisterial district petition for a local inspection as provided for in section 9 of the crop pest law, the State entomologist is directed to satisfy himself as to the needs of inspection in the community of which the petitioners are residents, either by making an investigation in person, or by an assistant; or by consultation of the records in the office of the crop pest commission, and to proceed, in conjunction with the proper local authorities and the petitioning freeholders, to execute the law as fully as is practicable.

11. *On the appointment of local inspectors.* In the appointment of local inspectors, as provided for in section 9 of the crop pest law, the State entomologist is directed to advise with the local people as to their wishes in this matter, and to satisfy himself that the persons selected for appointment are competent to execute the work required, in an accurate and proper manner, before issuing commissions to local inspectors. The commissions of local inspectors shall be signed by the chairman of the board, and countersigned by the secretary; and they shall be revocable at any time by the State entomologist, when the person holding the same does not appear to be accomplishing the work for which he has been appointed.

12. *In regard to instruction and duties of local inspectors.* The State entomologist shall in person, or by an assistant, give such instruction and assistance to local inspectors as may be necessary, so that they may be enabled to accomplish their duties in an accurate and expeditious manner; and he shall provide forms of records to be kept concerning all the premises inspected, and a special form of report concerning each and every premise found to be infested, which records of infested premises shall be made out in duplicate by the local inspector, and one copy filed with the State entomologist and the other filed with the clerk of the city council or the clerk of the board of supervisors of the county, of whatever city or county he may be serving as local inspector. The local inspectors shall, in the manner directed by the State entomologist, tag or mark infested trees and plants so that the same may be readily recognized, but he shall in no wise issue orders concerning the treatment of infested premises until he has submitted the report of the inspection of the same, accompanied by specimens, to the State entomologist, and has received from him a confirmation as to the statements made in his report, and has been directed by the State entomologist as to the action that he shall take in regard to any case of infestation.

13. *Issuance of recommendations as to treatment of infested plants.* Upon the receipt of the reports of local inspectors the State entomologist shall issue at once directions to all those persons having infested premises, specifying pre-

cisely the nature and manner of treatment to be pursued in order to control and eradicate the San Jose scale, and in each and every recommendation particular specifications shall be given as to the materials to be used and the manner of their application, and a copy of each such recommendation shall be furnished the local inspector for his guidance in executing the further directions which it may become necessary for the State entomologist to send him. The local inspectors shall report in full once each week to the State entomologist, and shall report once a month to the city council or the county supervisors of the city or county for which they are appointed, and shall submit a journal showing the premises inspected each day, with such general data concerning the same as directed by the State entomologist, and, as above directed, duplicate copies of reports upon each infested premise. Upon vacation of his office by a local inspector for any cause, he shall turn over to the city council or county board of supervisors the duplicate copies of all recommendations issued by the State entomologist.

14. *Directed to prescribe treatment.* The State entomologist is hereby directed to prescribe the nature and method of treatment of all plants whatsoever affected by the insect pests or plant diseases specified in section 2 of these regulations, and he is hereby charged with such investigations as to the nature and habits of these insect and fungous parasites, and the remedial measures therefor, as will enable him to give the best possible service to the people.

15. *Appeal from orders in relation to treatment.* Any appeal from the orders or directions of an officer acting under this board in dealing with the subjects specified in sections 4, 6, 13, and 14 of these regulations shall be made in writing, and shall be addressed to the secretary of the board within seven days upon receipt of a written order to destroy or treat plants as specified under sections 4, 13, and 14 of these regulations. The person, persons, firm, or corporation making an appeal shall be granted a speedy hearing by the board of crop pest commissioners, and accorded every opportunity to introduce material evidence relating to the facts alleged in the order of the officer requiring the destruction or treatment of plants.

16. *In relation to finances.* It is hereby ordered by the board of crop pest commissioners that all disbursements under this act shall be made by the treasurer upon certified bills as follows: All bills for supplies and merchandise of every description shall be certified to the treasurer by the officer or employee authorized by the board to make the expenditure in question, presumably by the State entomologist unless otherwise specified; and all bills for travelling expenses either of officers or employees shall be paid by the officer or employee authorized by the board to perform such duties requiring travel, and shall be repaid to such officer or employee by the treasurer, upon the presentation of an itemized bill duly certified by the State entomologist and approved by the secretary of the board. The State entomologist is hereby directed to collect from time to time the fees derived under section 12 of the crop pest law, and pay the same over to the treasurer of this board, and this officer shall account for such money so received in the same manner as for the appropriation received under section 14 of this act.

Such salaries and compensation for labor as are authorized by the board shall be paid by the treasurer on a regular monthly pay roll.

Officers or employees making bills for travelling expenses must state therein: For livery hire, the date and points between which the same was used; for railroad fare, the dates and points between which the trip was made; in hotel bills, the date and time for which paid must be given; and all items of an incidental nature must show the service or purpose for which payment was made.

Adopted May 30, 1903.

WASHINGTON.

AN ACT to promote the fruit-growing and horticultural interests of the State of Washington; to provide for the appointment of a commissioner of horticulture; to repeal certain laws in conflict therewith, and to provide penalties and punishment for its violation, with the amendments to sections four, five, six, seven, eight, twelve, fourteen, and fifteen, approved March 16, 1905, by Albert E. Mead, governor.

Be it enacted by the legislature of the State of Washington:

SECTION 1. That a commissioner of horticulture shall be appointed by the governor for the State of Washington. It is hereby provided, prior to the appointment, the applicant must furnish a certificate from the faculty of the college of agriculture that he is a skilled horticulturist; on such certificate the governor may make the appointment. Before entering upon the discharge of his duties, the said commissioner shall take and subscribe an oath to support the Constitution of the United States and the constitution and laws of the State of Washington, and to faithfully discharge the duties of his office, which said oath, together with the aforesaid certificate, shall be filed with the secretary of state. The said commissioner shall keep his office at Tacoma, which office shall be open to the public during normal office hours every day excepting Sunday and legal holidays and days when he may be necessarily absent attending to official duties in other parts of his district.

SEC. 2. The objects for which said commissioner is appointed are to maintain and exercise a supervisory directory over the horticultural industries of the State, to enforce the laws relative to the importation, transfer, and sale of fruit, fruit trees, plants, or nursery stock within the State, and give such instructions to fruit culturists regarding cultivation and extermination of fruit pests as the nature of the case may demand. The official term of the said commissioner of horticulture shall begin on the first day of April, 1905, and continue for four years, and until his successor is appointed and qualified. Said commissioner shall receive annually in full consideration for his official services the sum of two thousand dollars, to be paid monthly as other State officers, and for incidental expenses of his office—such as necessary traveling fare, stationery, and postage—the sum of one thousand dollars annually, and for office rent and bulletins one thousand dollars annually. Said sums shall be paid on warrants drawn by the State auditor on the presentation of proper vouchers therefor. The term of the present commissioner of horticulture shall expire April 1, 1905. When from illness or other cause the commissioner of horticulture is temporarily unable to perform his duties, he may appoint some qualified person to discharge the duties of such office until such disability is removed. Said appointment shall be in writing, signed by the commissioner of horticulture, and filed in his office. The appointment of such deputy may be revoked by the commissioner of horticulture at will. The commissioner of horticulture shall be responsible for the acts of his deputy: *Provided*, That no charge or claim shall ever be made against the State or any of its funds for compensation to such deputy.

SEC. 3. Said commissioner may be removed from office at any time for cause, such as inefficiency, neglect of duty, or immoral conduct, but no removal from the office of commissioner of horticulture shall be made for political reasons. Vacancies occurring in the office of commissioner during a term shall be filled by the governor making an appointment for the unexpired term, under the rules and regulations as prescribed in section 1 of this act for full-term appointment.

SEC. 4 (as amended by act of 1905). Fruit culturists in any county in this State are hereby authorized and empowered to organize into a horticultural

society, and the better to promote and protect the horticultural interests of the county, the society will nominate three qualified persons for county inspector of fruit, fruit trees, orchards, plants, boxes, barrels, and other packages in which fruit or fruit trees have been shipped. The nomination shall be made to the board of commissioners (of the county wherein said society is organized), who are hereby authorized and required to appoint such person as county fruit inspector for a term of two years, deliver to him a certificate of appointment, and mail a duplicate copy of said certificate to the commissioner of horticulture: *Provided, however,* That county inspectors shall be required to pass a satisfactory examination before the State horticultural commissioner, or the faculty of the agricultural college, before they are authorized to perform the duties of their office. In counties where no horticultural society exists, the county commissioner shall select and appoint a suitable person to act as county inspector, and report their action to the commissioner of horticulture for confirmation. All county fruit inspectors shall be entitled to such pay for their services as the board of county commissioners of the county in which their work was performed may direct. Any county inspector shall be removed by the commissioner of horticulture for incompetency, neglect of duty, or other sufficient cause, upon complaint filed with him signed by the proper officers of the horticultural society in the county in which such inspector is sought to be removed: *Provided,* That no such removal shall be made without giving such inspector a hearing and ten days' notice of the time and place thereof, such hearing to be had before the commissioner of horticulture. In order to furnish to the office of the commissioner of horticulture information regarding the condition of orchards throughout the State, and to determine the compensation of such county inspectors, they shall make monthly reports to the commissioner of horticulture under oath upon blanks furnished by said commissioner. All county fruit inspectors shall make a monthly report to the county commissioners of their county, setting forth the number of days' work performed and character thereof, and make oath to the correctness of such statement and furnish necessary vouchers upon which the county commissioners shall determine the accuracy of their accounts; such monthly report and rendition of account shall be sworn to by the county inspector before the clerk of the county court. Any county inspector who shall in said report under oath falsely state the number of days' work he has actually performed in any month, shall be deemed guilty of perjury and upon conviction thereof shall be liable to the penalty provided by law therefor.

SEC. 5 (as amended by act of 1905). No person, firm, corporation, or tree dealer shall engage or continue in the business of selling as agent, solicitor, or otherwise within the State or importing fruit trees, plants, or nursery stock into the State without having first obtained a license to carry on such business in this State, as in this act provided.

SEC. 6 (as amended by act of 1905). Any person, firm, corporation, or tree dealer, agent, or solicitor may obtain a license to engage or continue in the business of selling and importing fruit trees, plants, or nursery stock into this State by submitting his application therefor to the commissioner of horticulture, together with a satisfactory bond of one thousand dollars made in conformity with the laws of the State of Washington. All bonds submitted shall be made in conformity with the laws of the State of Washington, such bond to be approved by and filed with the said commissioner, conditioned that the principal and his or their agents will faithfully obey the provisions of this act, the laws of the State of Washington, and that the said principal pays the costs of inspection and destruction of all infected nursery stock, or other material or goods imported into and sold within such district of this State by said principal, his

or their agent. Any person or persons shall have legal recourse against the bond for any damages accruing from the sale of or delivery of infected nursery stock. All licenses issued by the commissioner of horticulture shall bear the name of the solicitor, agent, or salesman and shall not be transferable. Any solicitor or agent falsely representing any nursery, firm, corporation, or tree dealer shall be deemed guilty of a misdemeanor, and subject to a fine of not less than fifty nor more than one hundred dollars, and such conviction shall ipso facto work a forfeiture of his license. Any license granted to any person, firm, corporation, or tree dealer shall be suspended in its operation by the commissioner of horticulture upon the report of any inspector that said person, firm, corporation, or tree dealer has introduced infected stock into the State of Washington, and if upon examination by the commissioner such report of the inspector shall be found to be supported by facts, such license shall at once be revoked. The license fee for nurserymen and tree dealers shall be five dollars, and for their agents or salesmen, who shall be furnished an authentic copy, two dollars and fifty cents. Said money shall be collected by the State horticultural commissioner and paid to the treasurer of the State of Washington. All licenses shall expire on the first day of April, 1905, and on the first day of April every second year thereafter.

SEC. 7 (as amended by act of 1905). It shall be the duty of every person, firm, corporation, or tree dealer licensed to do business under this act to notify the horticultural commissioner of his intention to ship an invoice of fruit trees, plants, or nursery stock from one point to another within the State, or to import an invoice of similar goods from without to any point within the State, whether for the purpose of sale or for personal use. Such notice shall contain the name and address of both consignor and consignee and a descriptive invoice of the goods to be shipped, the freight or express office at which the goods are to be delivered, and the name or title of the transportation company from which the consignees received such goods. A copy of such notice shall also be mailed to the county fruit inspector in the county in which the point of destination is located. Such notices shall be mailed not later than the date of such shipment. Upon receipt at destination of any invoice of fruit trees, plants, or nursery stock, it shall be the duty of the freight agent, express agent, or other transportation company's employee having such invoice of fruit trees, plants, or nursery stock in charge to notify the county fruit inspector within whose jurisdiction said invoice is received of the receipt of said invoice, naming consignor and consignee, and that said invoice is ready for inspection, notification to be by telegraph or telephone, and to hold said invoice for inspection by the county fruit inspector before delivering said invoice of fruit trees, plants, or nursery stock to the consignee, excepting that said invoice need not be held more than twenty-four hours after notification is made to the county fruit inspector. The said inspection not to be made by the county fruit inspector until the freight, express, or other transportation charges are paid, unless the freight agent, express agent, or other transportation company's employee in charge of said invoice consents to said inspection being made before said charges are paid.

SEC. 8 (as amended by act of 1905). Any person, firm, corporation, or tree dealer who shall sell within this State, or import into this State, any fruit, scions, fruit trees, plants, or nursery stock in violation of the provisions of this act, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined for each offense in any sum not less than fifty nor more than one hundred dollars.

SEC. 9. Any person who shall offer for sale, or solicit persons within this State

to purchase from him, any fruit trees, plants, or nursery stock belonging to any person or firm not licensed under the provisions of this act shall be deemed guilty of a misdemeanor and fined in any sum not less than fifty dollars nor exceeding one hundred dollars. All fines imposed for the violation of the provisions of this act shall be paid to the treasurer of the county wherein the violation was committed and be placed to the credit of the general fund of such county.

SEC. 10. For the purpose of preventing the introduction and spread of contagious diseases, fruit pests, spores, and fungus growth among fruit trees and plants and other nursery stock and for the disinfecting and cure of fruit diseases, pests, spores, and fungus growths, the commissioner of horticulture shall prescribe such remedies as he shall deem best, describe and formulate such remedies with their proper mode of application, with such additional instructions as he may deem necessary, into a circular or bulletin, which he shall have printed and distributed to the several county horticultural societies and inspectors of the State. He shall include also in said bulletin the rules and regulations under which a person, firm, or corporation may lawfully sell, import into this State, and sell or authorize to be sold fruit trees, plants, or nursery stock, and the penalty to be incurred for the violation of these rules. He shall prepare also a poster which shall contain said rules, regulations, and penalties, which shall be distributed with said bulletin. County inspectors are directed to put up such posters in not less than three conspicuous places in their county, one of which places must be in front of the county court-house. The commissioner of horticulture shall hear and promptly decide all appeals from the county inspectors, and his decision shall have full force and effect until set aside by the courts of the State. In all cases of appeal he shall disregard technicalities and decide each and every case on its merits. All appeals from county inspectors to commissioners shall be under forms and regulations prescribed by the commissioner. The commissioner shall approve or reject all bonds required by law to be submitted to him, and he shall file and safely keep all bonds and other papers by law required to be filed with him, and shall, upon the expiration of his term of office, turn over the same to his successor. He shall examine all fruit, specimens of fruit trees, shrubbery, or plants submitted to him for examination; enter the name of the person presenting such specimens of fruit trees, shrubs, or plants for examination, and the result of his examination in a register to be kept by him for that purpose, and send a copy of such result to the person asking for the examination. He shall from time to time, as he may deem for the best interests of the horticultural industries of the State, publish bulletins which shall be sent free to the various county horticultural societies of the State; such bulletins to contain a brief résumé of the discoveries of science of interest to horticulture, or any other matter which the commissioner shall deem of importance to such interest. And unless there be urgent or special need therefor no bulletin shall contain any matter that has appeared in any previous bulletin.

SEC. 11. County fruit inspectors who shall be appointed under and by authority of this act are hereby authorized, directed, and empowered to enforce the provisions of this act to prevent the introduction and spread of fruit tree and plant diseases, insect pests, fungi spores, eggs or larvæ of insects injurious to the fruit industries of his county or of this State.

SEC. 12 (as amended by act of 1905). Whenever from any cause there shall be an absence of an inspector in any county the county commissioners of such county shall be notified by the commissioner of horticulture to appoint a county

fruit inspector. And in case of their failure to do so the commissioner of horticulture shall have power to order an inspector from any adjoining county in his district to perform the duties required by this act in the county needing the services of such inspector, and the expense of such inspection shall be chargeable to and paid for by the county in which the said services are rendered in the manner hereinbefore provided. Whenever any county fruit inspector requires assistance in the discharge of his duties he shall make written application to the county commissioners for the temporary appointment of an assistant, stating the length of time for which such assistant will be required, and all appointments of such assistant shall be left discretionary to the board of county commissioners. Assistant county inspectors shall have the same powers to perform the same duties as county inspectors, and such assistant shall be entitled to the same compensation and to be paid in the same manner as county inspectors.

SEC. 13. It is hereby made the duty of the county fruit inspector, if, from his personal observation, complaint, or other credible information, he has reason to suspect that any person, company, or corporation has an orchard, tree, or nursery of trees, vines, or garden, fruit packing house, storeroom, or that any other place or material in his county is infected with or is a repository for eggs, larvæ, or any noxious insects injurious to fruit and plants, or that any trees, fruits, or plants are in transit to his county from outside this State or are about to be disseminated or distributed within his county which are known to be or are suspected to be from localities that are infested with any disease or pest injurious or that may become injurious to the fruit interests of his county or State. He shall without delay inspect the premises, property, or material so suspected, and if the same is found to be infected as aforesaid, he shall notify the owner, his agent, or the person in charge of the same not to remove or allow the removal of such property until the same has been disinfected, prescribing the manner of disinfection, and shall direct the owner, agent, or person having such property in his charge to treat and disinfect the said premises and property within five days. If any person so notified shall permit the removal of or fail to disinfect such property or premises in the manner and in the time prescribed in said notice, the person so notified and failing to disinfect the infected property or premises, or who shall permit the removal of the same prior to disinfection, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than \$50 nor more than \$100 and the cost of action in court, which fine and costs shall be a judgment lien upon said premises or property. After the expiration of ten days and a failure on the part of the owner or person in charge to disinfect the said premises or property as aforesaid, then to prevent the spread of insect pests or disease it will be the duty of the county inspector to enter on such premises or property and disinfect the same. The cost of such disinfection shall be a lien against said property or premises, the payment of which shall be collectible with the costs in any court of this State.

SEC. 14 (as amended by act of 1905). Any person or persons who shall bring into the State, have in their possession, or offer for sale or distribute or give away, fruit trees, shrubs, fruit, or other material infested with any kind of insect pest injurious to fruit, fruit trees, or plants shall be guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine of not less than fifty dollars nor more than five hundred dollars, or by imprisonment in the county jail not less than sixty days nor more than one year: *Provided*, That for each repeated offense the person or persons convicted may be pun-

ished by a fine of not less than two hundred dollars nor more than eight hundred dollars, or by imprisonment not to exceed two years. Any person or persons who shall sell, offer for sale, distribute, or give away any tree or trees, root or roots, grass, cuttings, or scions infected with insect pests, spores, or fungus growth shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be punished by a fine of not less than fifty dollars nor more than two hundred dollars, or by imprisonment in the county jail not less than fifteen days nor more than thirty days. A repetition of the offense shall subject the offender to increased penalty not over the maximum above stated. Any nursery trees, shrubs, or plants which have been shipped from and to any place within the State for distribution or for planting and which are infected with any injurious insect, larvæ, or fungus growth shall be disinfected under the direction of the inspector of the county where such trees and plants are taken, and the cost of such disinfection shall be charged to the owner of said articles and shall be a lien on such trees, shrubs, or plants until paid, and the person in possession of such articles being held subject to lien shall have a legitimate claim against the party from whom he received the articles for reimbursement of costs, including cost of collection, and shall have recourse against the bond of the person furnishing the articles, and such claim may be enforced in any court of competent jurisdiction of the State. That any agent, tree dealer, or salesman who shall solicit orders for fruit trees or nursery stock shall leave with the person giving such order a duplicate of the same, and attach thereto a certificate to be signed by such salesman or agent, naming the nursery from which such nursery stock will be supplied and its location.

SEC. 15 (as amended by act of 1905). The county fruit inspector shall, in the performance of his duties as such inspector, have on any day except Sunday free access to orchards, nurseries, gardens, hop fields, packing houses, fruit sheds, and storerooms where fruit may be kept; fruit boxes, full or empty, or any other material or place suspected of being infected with insect pests or diseases injurious to the fruit interest of the State. If he find any nursery, orchard, garden, or other place or material infected with insects or fungus growth, larvæ, or spores injurious to the fruit interests, he shall forthwith notify in writing the owners, occupants, or persons in possession thereof that the same is infected, prohibit their removal, and direct the manner in which the same shall be disinfected. If the owner, occupant, or person in possession of said orchard, garden, storeroom, fruit stand, or other place, or infected material shall not within ten days disinfect the same in the manner by the county inspector provided or shall not have appealed from the decision of the county inspector to the commissioner of horticulture, if the premises infected be an orchard, or nursery of fruit trees, a garden, fruit stand, or storeroom, and the person or persons in charge thereof have neglected or refused to disinfect the said premises within the time specified in said notice nor have appealed as aforesaid, then the county inspector shall enter on and disinfect part or all of said premises so neglected, and the cost thereof shall be a legitimate [legitimate] charge and lien, with interest until paid, upon the real property of the owner of such premises so disinfected; such lien shall be collectible with costs in suit in any of the courts of the State as other lawful claims are collectible. If the infected property be transportable material, the county inspector shall notify the person in charge thereof not to remove the same and to disinfect the same within twenty-four hours and describe the manner of disinfection. If the person in charge of said infected material neglect or refuse to disinfect the same as notified or fail to appeal, then the inspector shall destroy such infected

material or fruits, fruit boxes, baskets, wrappings, portable fruit stands by burning the same. If an appeal be taken, the inspector shall, after twenty-four hours' notice take immediate possession of such movable property and safely keep them until the appeal be decided. If the decision of the commissioners be in favor of the appellant, the property shall be returned to him; on an adverse decision the property must be destroyed by the inspector. All appeals from the action or demand of the county inspector shall be taken to the State commissioner of horticulture. That no county fruit inspector shall act as solicitor or agent for the sale or distribution of any nursery stock, supplies, or machinery for use in orchards, nor engage in the purchase or marking of fruit from any orchard save his own. When satisfactory evidence that any county fruit inspector has violated the provisions of this section, the horticultural commissioner shall remove such inspector and report the removal to the county commissioners of his (the inspector's) county.

SEC. 16. The said commissioner of horticulture shall be allowed seven hundred dollars (\$700) per annum for the employment of one office clerk, who shall be continually in the office of the commissioner during normal office hours, and whose salary shall be paid monthly.

SEC. 17. There shall be kept and maintained in the office of the commissioner in the city of Tacoma an exhibit of the fruits of the State of Washington, and for the maintenance of such exhibit an annual appropriation of three hundred dollars (\$300) per annum is hereby made, to be paid out upon warrants drawn by the State auditor upon the presentation of proper vouchers.

SEC. 18. An annual "inspector's institute" shall be held during the month of January at the agricultural college at Pullman. The commissioner of horticulture shall fix the date of convening of such institute and by written notices direct the attendance of all county inspectors. The commissioner shall preside over and formulate the proceedings of the institute, which shall continue for four days. As the purpose of these institutes is improvement and conference and study of insects, of experimentation by the scientist of the college along entomologist and horticultural lines, it is required that all county inspectors shall attend such institute meetings unless prevented by illness. Failure to attend on the part of any inspector shall work a forfeiture of his office, and it shall be the duty of the commissioner to inform county commissioners of the absence of their inspectors. Inspectors attending institutes shall be allowed their actual traveling expenses and hotel bills on vouchers endorsed by the commissioner or chairman of institute, said expenses to be paid by the respective counties.

SEC. 19. Any person offering any hindrance to the carrying out of this act or in any manner preventing or hindering any inspection herein provided for shall, upon conviction, be fined not less than twenty-five dollars nor more than two hundred dollars, together with the costs.

SEC. 20. [Refers to appropriation.]

SEC. 21. A certain act approved March 17, 1897, and entitled "An act to promote and protect the fruit-growing and horticultural interests of the State of Washington, to provide for the appointment of commissioner of horticulture and to repeal certain laws in conflict therewith," and all other laws or parts of laws inconsistent with or in conflict with the provisions of this act, are hereby repealed.

SEC. 22. An emergency exists, and this act shall take effect and be in force from and after its approval by the governor.

WEST VIRGINIA.

CHAPTER 33, ACTS OF 1901.

AN ACT to prevent the introduction and spread of the San Jose scale and other dangerous insects and dangerously contagious diseases affecting trees, shrubs, vines, plants, and fruits.

Be it enacted by the legislature of West Virginia:

1. That the director of the West Virginia agricultural experiment station, immediately on the taking effect of this act, shall appoint a competent person or persons who shall, under the direction of the said director, perform the duties hereinafter provided.

SEC. 2 (as amended by chapter 49, Laws of 1903). It shall be the duty of the director, either in person or through his assistants, to seek out and devise means of suppressing and eradicating throughout the State the San Jose scale and other dangerous insects, and tree, shrub, vine, or plant diseases. Black knot and peach yellows are hereby declared to be dangerous within the meaning of this act, and trees, shrubs, vines, or plants affected with either of these diseases shall be subject to its provisions. The mention of San Jose scale, peach yellows, and black knot, in this section, shall not be held to exclude other insects or diseases, which may be found to be dangerous, from the provisions of this act. Said director in person, or through his assistants, shall examine once in each year, not later than September fifteenth, all nurseries in the State of West Virginia, as to whether they are infested with San Jose scale or other dangerous insects, or infected with dangerous contagious tree, vine, shrub, or plant diseases; and if upon inspection such nurseries appear to be free from such insects or diseases, the director shall give each owner of such nursery or nurseries a certificate to the facts. Nurserymen must furnish transportation to and from railway station and facilities for reaching their growing stock to such person or assistant selected by the director to make said inspection. This certificate shall be void after September fifteenth of the year following. A duplicate of each certificate, together with a statement of amount received therefor, shall be filed by said person or assistant with said director within ten days of its issue, and neglect to file such duplicate of certificate and statement shall be treated as a misdemeanor. If any dangerously injurious insects or infectious diseases are found on the premises of any nursery or nursery stock the director may order and enforce such treatment of said nursery stock as he may deem sufficient, in addition to a thorough inspection, before granting a certificate.

Whenever a nurseryman, or any person shall ship or deliver within this State, except for scientific purposes, trees, shrubs, plants, or other nursery stock, he shall place upon each carload, box, bale, or package a copy of a certificate, the original of which is signed by a State or Government inspector, stating that such stock has been inspected and has been found apparently free from dangerous insects and dangerously contagious tree, shrub, vine, and plant diseases. The illegal use of said certificates by changing, defacing, or placing it on uninspected stock, or using the same after date of expiration or revocation, shall render the owner or shipper liable to the penalty prescribed for a violation of this act. No person growing for sale any trees, shrubs, vines, or plants, shall deliver the same without applying to the director for the certificate provided for in this act.

No person growing for sale, or having in his possession with intent to sell, any trees, shrubs, vines, or plants, shall deliver the same before having thor-

oughly fumigated the same according to rules prescribed by said director or other State and Government inspector.

SEC. 3 (as amended by chapter 49, laws of 1903). It shall further be the duty of said director, through his assistants, to cause the examination of all orchards, gardens, and other premises, either public or private, which they shall have reason to suppose to be infested or infected with any dangerously injurious insects or infectious diseases liable to spread or to be conveyed to other premises, and for this purpose said director and his assistants are authorized, during reasonable business hours, to enter into or upon any farm, orchard, nursery, garden, storehouse, or other building or place used for growing, storing, packing, or sale of nursery and other horticultural products. If said director or his assistants shall find on inspection, as aforesaid, that any nursery, orchard, garden, or other property or place is infested or infected with such dangerously injurious insects or infectious diseases, liable to spread or to be conveyed to other premises, to the serious injury of the property thereon, the same shall be declared a public nuisance; and he shall notify, in writing, the owner or persons in charge of such infested or infected property, and shall direct him, within a time and in a manner prescribed in such notice, to use such means as shall prevent the conveyance or spread of such insects or diseases to the property of others; and such infested or infected property must not be removed from the premises after the owner or person in charge of the same shall have been notified, as aforesaid, without the written permission of said director or his assistants. If the person so notified shall refuse or neglect to treat and disinfect said premises or property, in the manner and within the time prescribed, it shall be the duty of the director to cause such premises or property to be so treated, and they shall certify to the owner or person in charge of such premises the cost of the treatment. If said sum is not paid to them within sixty days thereafter the same may be recovered, together with the cost of action, before any court in the State having competent jurisdiction.

Any tree, plant, shrub, et cetera, which may, in the judgment of the director or his assistants, be so badly infested or infected as to render expense of treatment unjustifiable, shall be declared a public nuisance, and may be destroyed by them or their assistants without liability for compensation to the owner thereof. Right of appeal from the decision or requirements of the assistants may be made to the said director within three days after notice of such decision or requirements has been served, and the decision of the director shall be final.

SEC. 4 (as amended by chapter 49, Laws of 1903). Every package of trees, shrubs, vines, or plants shipped into this State from any other State, Territory, country, or province, shall be plainly labelled on the outside with the names of the consignor and consignee, and a certificate showing that the contents have been inspected by a State or Government officer, and that the trees, shrubs, vines, or plants therein contained have been fumigated, according to rules prescribed by the State or Government officer, and appear to be free from all dangerous insects and dangerously infectious diseases. If any trees, shrubs, vines, or plants are shipped into this State without such certificate plainly affixed on the outside of the package, box, or car containing the same, the consignee thereof shall not receive, use, or distribute the same until the consignor shall have affixed thereto the certificate of inspection required by this act. When nursery stock is shipped into this State accompanied by a certificate, as herein provided, it shall be held prima facie evidence of the facts therein stated. But the director or his assistants, when they have reason to believe that any such stock is infested or infected, as heretofore described, shall be authorized to inspect the same. In case such stock is found to be infested or infected by any

of the aforesaid insects or plant diseases, such stock shall be held subject to order of shipper, not to exceed ten days, before being declared a public nuisance and destroyed. All expenses incurred by the director or his assistants in carrying out the provisions of this act shall be paid out of the funds appropriated by this act.

SEC. 5. Any person violating or neglecting to carry out the provisions of this act, or offering any hindrance to the carrying out of this act, shall be adjudged guilty of a misdemeanor, and upon conviction before any justice of the peace shall be fined not less than ten dollars and not more than one hundred dollars for each and every offense, together with all the costs of the prosecution, and shall stand committed until the same is paid. It shall be the duty of the prosecuting attorney to prosecute all violations of this act and all amounts so recovered shall be paid over into the State treasury.

SEC. 6. The director shall make an annual report to the governor of the State, a copy of which shall be sent to the West Virginia Horticultural Society at its annual meetings, showing the number of nurseries inspected, the number of certificates issued, the number of trees treated or disinfected by them or their assistants, the kinds and amount of property destroyed by them in pursuance of this act, and such other facts concerning the operation of their office under this act as the said director may deem necessary.

SEC. 7. The provisions of this act shall not apply to florists' greenhouse plants, bulbs, flowers, and cuttings commonly known as greenhouse stock.

SEC. 8 (as amended by chapter 49, laws of 1903). The said assistants shall make to said director an itemized statement of their expenses and the amounts paid for such assistants employed in prosecuting the work under this act, which, when certified by the said director, shall be paid out of the State treasury upon the warrant of the auditor of the State.

SEC. 9. [Makes appropriations for year 1901.]

SEC. 10. The act heretofore passed at the present session of the legislature is hereby repealed.

Passed by the legislature of West Virginia, February 16, 1901, and became effective ninety days from its passage.

CHAPTER 61 OF THE ACTS OF 1905.

AN ACT to amend and reenact chapter 48 of the acts of 1903, relating to the sale of fruit trees, vines, and shrubbery, and to add thereto sections 3 and 4.

Be it enacted by the legislature of West Virginia:

1. That chapter forty-eight of the acts of nineteen hundred and three be amended and reenacted so as to read as follows:

SECTION 1. That every dealer in and grower of fruit trees, vines, and shrubbery, whether in or out of this State, who employs traveling salesmen or agents for the sale of fruit trees, vines, or shrubbery in this State shall, before he is authorized to do business, take out a license in some county in this State, said license to be issued by the assessor in like manner as other licenses, and he shall pay to the sheriff of the county wherein said license is issued the license fee, which is hereby fixed at ten dollars per annum. Every such dealer or grower, as hereinbefore mentioned, whether such dealer be an individual, firm, or corporation, shall file with the clerk of the county court in each county where such individual has traveling salesmen or agents a list of all agents or traveling salesmen in said county representing such dealer or grower, which list when filed shall be open to public inspection.

SEC. 2. No person shall act as agent or traveling salesmen in this State for any firm, person, or corporation engaged in growing, selling, or handling fruit trees, vines, or shrubbery until such firm, person, or corporation shall have complied with all the provisions of the foregoing section and taken out the license in some county of this State therein provided for. Any person violating this section shall be guilty of a misdemeanor, and fined not less than twenty-five dollars nor more than one hundred dollars upon conviction, and may be confined in jail not to exceed six months, in the discretion of the judge or justice before whom the case is tried. The license hereinbefore provided for shall authorize such person to transact business in any county of the State upon the filing of the lists of agents or traveling salesmen employed therein, together with a certified copy of the license with the clerk of the county court. Every person acting as agent or traveling salesman for any person, firm, or corporation engaged in growing or selling fruit trees, vines, or shrubbery shall take from his employer a certificate showing that he is the authorized agent or salesman of such person, firm, or corporation, and shall exhibit the same to any person who demands to see said certificate, and any person who fails to do so, before acting as salesman or agent for any person, firm, or corporation engaged in growing or selling any fruit trees, vines, or shrubbery, shall be guilty of a misdemeanor, and be fined ten dollars upon conviction.

SEC. 3. Any person, firm, or corporation that shall label any trees or vines any false or fictitious name or variety, or who shall substitute, without the permission of the purchaser, trees from any nursery other than the one wherein it was represented the stock sold was grown, shall be deemed guilty of a misdemeanor, and upon conviction fined not less than twenty-five dollars nor more than two hundred dollars, and shall, in addition thereto, forfeit the license held and shall thereafter be precluded from doing business in this State.

SEC. 4. If any person acting as agent or traveling salesman for any person, firm, or corporation sell any trees, vines, or shrubbery upon a certificate of agency, and afterward, without the consent of the purchaser, procure them of and supply them from the nursery of some person or place other than that such agent or salesman professed to represent, he shall be deemed guilty of a misdemeanor and fined not less than twenty-five dollars nor more than one hundred dollars.

WISCONSIN.

CHAPTER 180.

AN ACT to prevent the introduction or spread of San Jose scale and other injurious insect and fungus diseases, and making an appropriation therefor.

The people of the State of Wisconsin, represented in senate and assembly, do enact as follows:

SECTION 1. The director of the agricultural experiment station of the University of Wisconsin is hereby authorized to inspect, through his agent, any nursery or any fruit or garden plantation or any unplanted or heeled-in nursery stock in this State that he has reason to suspect is infested by San Jose scale or other injurious insects and fungus diseases, and for this purpose his agent shall have free access to and egress from any field, garden, packing ground, building, cellar, or other place where the duties of carrying out the provisions of this act shall call him, and any person attempting to hinder such inspection by misrepresentation or otherwise shall be liable to the payment of a penalty or forfeiture as hereinafter provided.

SEC. 2. In case the agent of the said director shall find present on any nursery premises, or packing ground, or in any cellar or building used for the storage of nursery stock, or on any fruit or garden plantation any of the aforesaid San Jose scale or other injurious insects and fungus diseases he shall notify the owner, or the person having charge of such premises for the owner, in writing, to that effect, and if such owner, after receiving such notice, shall ship or deliver any trees, vines, shrubs, or plants affected by such San Jose scale or other injurious insects and fungus diseases he shall be subject to the payment of a penalty or forfeiture as hereinafter provided.

SEC. 3. Whenever any trees, shrubs, plants, or vines are shipped into this State from another State, country, or province without a certificate plainly fixed on the outside of the package, box, or car containing the same, showing that the contents had been inspected by a duly appointed State or Government officer, and that they appear free from San Jose scale and other injurious insects and fungus diseases, the fact must be promptly reported to the said director by the railway, express, or steamboat company or other persons carrying the same, with the statement of the source whence such articles came, and the party to whom they are addressed; and any railway, steamboat, or express company or person who shall violate the provisions of this section shall be subject to the payment of a penalty or forfeiture as hereinafter provided.

SEC. 4. Any person growing or offering for sale in this State any nursery stock that is known to be infected with San Jose scale or other injurious insects and fungus diseases shall, upon demand of the said director, furnish within twenty days a list of all persons, as far as to him known, to whom he has sold or delivered any such stock, together with the post-office address of each of such persons, so far as to him known; such information shall be preserved and be for the sole use of the said director and his agent in carrying out the provisions of this act. And any person violating the provisions of this section shall be liable to the payment of a penalty or forfeiture as hereinafter provided.

SEC. 5. The said director shall cause to be issued to the owner of any nursery in this State, after the nursery stock therein has been properly inspected and found to be apparently free from San Jose scale or other injurious insects and fungus diseases, an official certificate to that effect, good for a period not to exceed one year, upon a payment to the said director the sum of five dollars for each ten acres of land owned or leased by such nurseryman in this State that is devoted wholly or in part to nursery stock, grown for sale purposes, and such owner may apply to said director for inspection of his premises for the purposes of securing such certificate, and the said director shall cause such inspection to be made within three months after receiving the application, unless such inspection shall be delayed by winter weather, but no such certificate shall be issued covering only a part of the nursery stock owned by one person, nor to cover nursery stock received after such inspection was made; and any such certificate may be cancelled by the said director upon the discovery in such nursery of the San Jose scale or other injurious insects and fungus diseases.

SEC. 6. Any nurseryman holding a valid certificate, issued as prescribed in section 5 of this act, may apply to the said director for official labels or tags, for which the said director may charge a sum not to exceed thirty cents per hundred, which labels or tags shall certify that the packages or bundles of nursery stock to which they are attached are from nursery stock that has been officially inspected and found apparently free from San Jose scale or other injurious insects and fungus diseases; but no such tags or labels shall be used

for stock not covered by the aforesaid certificate nor after such certificate has expired or been cancelled; and no person shall attempt to imitate or counterfeit such tags or labels. Any person violating the provisions of this section shall be liable to the payment of a penalty or forfeiture as hereinafter provided.

SEC. 7. In case any person shall violate any of the provisions of this act, he shall be liable for the payment of a penalty or forfeiture of not less than twenty-five dollars nor more than one hundred dollars for each and every such violation. Such penalty or forfeiture may be sued for and recovered in a civil action, as provided in chapter 142 of Sanborn & Berryman's annotated statutes.

SEC. 8. The director of the experiment station shall make a report to the secretary of state on the last week day of May of each year of all operations carried out under the provisions of this act, and shall turn over all moneys received by him or by his agents in carrying out its provisions to the State treasurer, to be by him credited to the general fund.

SEC. 9. The director's agent shall be compensated for time actually and necessarily expended in carrying out the provisions of this act, but such compensation shall in no case exceed three dollars per diem and necessary traveling expenses, but the said director of the experiment station shall receive no compensation for carrying out the provisions of this act.

SEC. 10. All expenses incurred under the provisions of this act shall be approved by the director of the experiment station and be audited by the secretary of state, and the secretary of state shall draw his warrant for the same upon the State treasurer, who shall pay the same out of the general fund, and for this purpose the sum of three hundred dollars, or as much thereof as may be necessary, is hereby annually appropriated.

SEC. 11. This act shall take effect and be in force from and after June first, 1899.

Approved April 14, 1890.

WYOMING.

CHAPTER 50.

AN ACT to create the Wyoming State board of horticulture, to prescribe its powers and duties, and to appropriate money therefor.

Be it enacted by the legislature of the State of Wyoming:

SECTION 1. There is hereby created a State board of horticulture, to consist of six (6) members, four of whom shall be appointed by the governor, one from each of the horticultural districts that are hereby created, the professor of botany and zoology of the State University and the State executive shall be ex officio members.

SEC. 2. The State shall be divided into four horticultural districts, whose boundaries shall be the same as the boundaries of the water districts of the State.

SEC. 3. The members shall reside in the district for which they are appointed. They shall be selected with reference to their study of and practical experience in horticultural and the industries dependent thereon. They shall hold office for a term of four years, and until their successors are appointed and qualified: *Provided, however,* That two of the board first appointed (to be determined by lot) shall retire at the expiration of two years. All vacancies in the board shall be filled by appointment of the governor, and shall be for the unexpired term.

SEC. 4. The board is authorized to employ a secretary and prescribe his duties, who shall hold his appointment at the pleasure of the board. Before entering

upon the discharge of his duties each member and employee of the board shall take and subscribe to the oath of office, which said oath shall be filed with the secretary of state.

SEC. 5. The board may call together and hold, in conjunction with horticultural societies, public meetings of those interested in horticulture and kindred pursuits, and may select books, pamphlets, and other documents containing information relating to horticulture; to collect statistics and general information showing the actual condition of horticulture in this State and elsewhere, and may publish and distribute such proceeding and information as in its judgment may seem proper, provided the sum so expended shall not exceed the sum of \$200.00 per annum.

SEC. 6. The office of the board shall be located at such place as a majority thereof may determine, and shall be in charge of the secretary during the absence of the board.

SEC. 7. For the purpose of preventing the spread of contagious diseases among fruit and fruit trees, and for the prevention, treatment, cure, and extirpation of fruit pests, and diseases of fruits and fruit trees, and for the disinfection of grafts, scions, and orchard debris, empty fruit boxes and packages, and other suspected material or transportable articles dangerous to orchards, fruit, and fruit trees, said board may prescribe regulations for the inspection, disinfection, or destruction thereof, which regulation shall be circulated in printed form by the board among fruit growers and fruit dealers of the State, and shall be published at least ten days in two horticultural papers of general circulation in the State, and shall be posted in three or more conspicuous places in each county in the State, one of which shall be at the county courthouse thereof.

SEC. 8. The said board shall select from their own number, or appoint from without their number, to hold office at the pleasure of the board, one competent person in each district, to be known as, and act as, inspector of fruit pests. Said inspectors shall be selected with reference to their study and practical experience in horticulture. It shall be the duty of the inspectors to visit the nurseries, orchards, store packing houses, warehouses, and other places where horticultural products and fruits are kept and handled within their respective districts, and see that the regulations of the State board of horticulture to prevent the spread of fruit pests and diseases of trees and plants, and the disinfection of fruits, trees, plants, grafts, scions, orchard debris, empty fruit boxes, and other material shall be fully carried out and complied with. Said inspectors shall have free access, at all times, to all premises where any trees, plants, fruits, or horticultural products or supplies are kept or handled, and shall have full power to enforce the rules and regulations of the State board of horticulture, and to order the destruction, spraying, and disinfection of any or all trees, plants, fruits, pits, or horticultural products or supplies found to be infected with any diseases as prescribed or designated by said board.

SEC. 9. It shall be the duty of every person or persons, corporation or corporations, who shall sell or deliver to any person or persons, corporation or corporations, any trees, plants, vines, scions, grafts, or pits, to notify the inspector of said district wherein such trees, plants, vines, et cetera, are to be delivered at least five days before said goods are to be delivered, giving the date and nursery or railroad station where said trees, plants, scions, etc., are to be delivered, together with the name of the party or parties who are to receive the same. It shall be the duty of the inspector receiving said notice to inspect the said trees, plants, grafts, etc., as soon thereafter as practicable, and at the point where the same are to be delivered, and if the same be found free from any and all diseases or pests as designated by said State board of horticulture he shall

so certify and attach such certificate to each lot or bill of such list of said grafts, scions, plants, or vines so inspected. But if any of the trees, grafts, scions, vines, or plants so inspected shall be found to be diseased or infested with any of the pests as prescribed by said board, then the inspector shall order the disinfection or destruction of such trees, grafts, scions, vines, etc., so diseased or infected, together with all boxes, wrapping, or packing pertaining thereto.

SEC. 10. If any person or persons in charge or control of any nurseries, orchard, storeroom, packing house, or other place where horticultural products or supplies are handled or kept, shall fail or refuse to comply with the rules and regulations of the said board of horticulture of this State or shall fail or refuse to disinfect or destroy any diseased or infected trees, plants, vines, scions, grafts, shrubs, or other horticultural supplies or products, when ordered to do so by the inspector of such district, he shall be deemed guilty of misdemeanor, and, upon conviction thereof, shall be fined in any sum not less than twenty dollars (\$20.00) nor more than two hundred dollars (\$200.00).

SEC. 11. It shall be the duty of every owner or manager of orchards, nurseries, storerooms, packing houses, or other place where horticultural supplies are kept or handled which shall become diseased or infected with any injurious insect or pest, to immediately upon the discovery of the existence of such disease or pest, to notify the inspector of said district of the existence of same. It shall be the duty of such owner or manager, at his own proper expense, to comply with and carry out all the instructions of said inspector for the eradication of said pest or disease. Any person who shall fail or refuse to comply with the instructions of said inspector, for the eradication of any disease or pest, shall be deemed guilty of misdemeanor, and, upon conviction thereof, shall be fined in any sum not less than twenty dollars (\$20.00) nor more than two hundred dollars (\$200.00).

SEC. 12. If any person or persons, corporation or corporations shall fail or refuse to forthwith comply with the instructions of said inspector for the eradication of any disease or pest, said inspector shall proceed forthwith to eradicate said disease or pest and the expense of the same shall become a charge and lien upon the property of said owner.

SEC. 13. Every person who for himself or as an agent for any person or persons, corporation or corporations, transportation company or common carrier, shall deliver or turn over to any person or persons, corporation or corporations any trees, vines, shrubs, nursery stock, scions, grafts, or pits without first having attached the inspector's certificate, as provided in section 9, this act, shall be deemed guilty of misdemeanor and, upon conviction thereof, shall be fined in any sum not less than twenty dollars (\$20.00) nor more than two hundred dollars (\$200.00).

SEC. 14. No person or persons, corporation or corporations shall be liable to any other person or persons, corporation or corporations for any damage to the trees, vines, shrubs, nursery stock, scions, or grafts by reason of the same being held to await the certificate of the inspector, as provided in section 9 of this act.

SEC. 15. The inspectors of fruit pests, appointed or elected by said board, shall receive as compensations for their services such sums as the board may regulate, provided that it is not to exceed five dollars (\$5.00) per day for the time actually employed. The members of said board shall receive no compensation for their services except actual expenses paid out. The secretary of said board shall receive such sum for his services as the board may designate.

SEC. 16. All bills for expenditures under this act shall be audited and passed upon by said board of horticulture, and if found legal and just shall be allowed, subject to the approval of the State examiner, and a warrant shall be drawn

therefor upon the auditor of the State of Wyoming, who shall draw his warrant upon the State treasurer therefor.

SEC. 17. It shall be the duty of the secretary to attend all meetings of the board and procure records of the proceedings and correspondence, to collect books, pamphlets, periodicals, and other documents containing valuable information relating to horticulture, and to preserve the same; to collect statistics and other information showing the actual condition and progress of horticulture in this State and elsewhere; to correspond with agricultural and horticultural societies, colleges, and schools of agriculture and horticulture, and other persons and bodies as may be directed by the board, and prepare, as required by the board, reports for publication; he shall also act assistant to and obey the directions of the inspectors of fruit pests, under the direction of the board.

SEC. 18. The board shall biennially, in the month of January, report to the legislature a statement of its doings and abstracts of the reports of the inspectors of fruit pests and of the secretary.

SEC. 19. There is hereby appropriated for the use of the State board of horticulture, as set forth in this act, out of the money in the State treasury not otherwise appropriated, the sum of three thousand dollars (\$3,000.00), or as much thereof as may be necessary. For the year commencing March, 1905, fifteen hundred dollars (\$1,500.00), or as much thereof as may be necessary for the year commencing March 1st, 1906.

SEC. 20. All sums of moneys collected as fines for violations of any of the provisions of this act shall be turned into the State treasury for use in defraying the expenses of the board hereby created, and the appropriations hereby made shall be paid out of the fund to the extent of the money therein contained.

SEC. 21. No person, firm, or corporation shall engage or continue in the business of selling within the State, or importing fruit trees, plants, or nursery stock into the State without first having obtained a license to do business in the State, as in this act provided.

SEC. 22. Any person, firm, or corporation may obtain a license to engage in the business of selling fruit trees, plants, or nursery stock in this State upon the payment of the sum of twenty-five dollars (\$25.00) and by filing with the secretary of the State board of horticulture bonds for securities in the sum of five hundred dollars (\$500.00) conditioned that the principal will faithfully obey the law of the State of Wyoming and that said principal will pay the cost of fumigation of all nursery stock or other materials or goods imported into or sold within the State by the said principal or principals or his or their agent, and the expense of destruction of any infected nursery stock. Licenses granted under this act shall be for a period of two years: *Provided, however,* That such license may be revoked at any time for any violation of this act at the discretion of the board.

SEC. 23. Any person or persons, corporation or corporations, transportation companies or common carriers violating any of the provisions of this act shall be deemed guilty of a misdemeanor and fined in the sum of not less than twenty dollars (\$20.00) nor more than two hundred dollars (\$200.00).

SEC. 24. This act shall take effect and be in force from and after its passage.

Approved February 15, 1905.

REGULATIONS.

1. It shall be the duty of all persons or corporations engaged in the growing of nursery stock in the State of Wyoming, for sale or distribution, to notify the secretary of the board of their purpose to engage in said business. The secretary

shall then each year, between the fifteenth day of July and the fifteenth day of September (at his convenience) carefully inspect all the nursery stock of said persons, firms, or corporations, and if said stock is found apparently free from San Jose scale and all other seriously dangerous insects and diseases, shall issue license without cost and a certificate of inspection authorizing the owner or owners thereof to dispose of and distribute the same at any time prior to the first day of July of the next succeeding year.

Inspection shall be without cost to the owners of such premises and nursery stock, unless it be found that said stock be so infested or diseased as to require disinfection, fumigation, or other treatment, or the destruction of the stock, in which case the directions of the inspector shall be carried out by the owner at his own cost, as contemplated by the act authorizing these regulations.

2. No person or corporation, either within or without the State, shall deliver or ship out from his nursery or place of business, for delivery within Wyoming, nursery stock of any kind contemplated by this act which does not have attached (in plain sight) to the stock or the bundle in which it is contained the authorized shipping tag of the board, certified by the fac simile signature of the secretary.

3. All persons, firms, or corporations complying with sec. 22 of this act shall, in addition thereto, file with the secretary a certified certificate showing that the stock from which it is proposed to ship into Wyoming has been inspected by the proper State, district, or county official of the State in which such person, firm, or corporation is located, and that it has been found apparently free from San Jose scale and all other seriously dangerous insects and diseases. Such certificate shall be held as prima facie evidence of the facts therein stated, and no further inspection will be required. But the board expressly reserves the right, when for any cause it may deem it wise to do so, to reinspect any shipments that may reach the State. In case any shipment is found not in accordance with the requirements of this act and the regulations of the board, as certified in the filed certificate of the shipper, the board may proceed against such shipper as provided in this act, and may revoke his license to do business in Wyoming.

4. Licenses and certificates issued to persons, firms, and corporations (whether within or without the State) cover only stock grown in their own grounds or nurseries, and no stock secured from other growers may be distributed in this State, unless it be secured from such as hold similar licenses and certificates, and then only on application to the secretary for permit to use such stock. (List of those possessing licenses will be supplied to anyone on application.) All shipping tags must bear the name of the consignee as well as that of the consignor, and must plainly indicate the contents of the shipment to which it is attached.

5. All persons, firms, or corporations (whether within or without the State) holding licenses or certificates authorizing them to do business in Wyoming, shall make monthly reports to the secretary of this board embodying the following facts:

(1) The number and date of deliveries or shipments made within or into the State.

(2) The number of each kind of tree, shrub, or other plant so delivered or shipped.

(3) The consignors and their several addresses, and such other facts as may be called for in the blanks supplied by the secretary for this purpose.

6. Blank bonds, certificates, reports, and shipping tags will be supplied free

by the board, through the secretary, except that for the tags the actual cost of the printed tags will be charged.

7. It shall be the duty of the secretary to supply to nursery men and others, on request, printed directions for disinfecting nurseries and orchards or fumigating nursery stock with hydrocyanic-acid gas, and to supply such other available information as may be of service in securing freedom from dangerous insects and diseases in the orchards of the State, and in the nurseries holding the license of the board.

8. No person, firm, corporation, or transportation company shall receive for shipment into this State any nursery stock in bundle, package, box, or in any other form unless it bear in plain sight the authorized shipping tag of this board as certified by the fac simile signature of the secretary. Such shipment must bear the name of the consignee, as well as that of consignor, and must plainly indicate the character of the contents.

If through the negligence of agents or others any nursery stock be received for delivery at any station in Wyoming without the proper shipping tag, it shall be the duty of the agent at said station to notify the secretary of the board and to hold the shipment subject to his directions.

9. The term "nursery stock" in this act shall be interpreted to mean all fruit and shade trees (except evergreens), and all shrubs and other plants commonly known as "small fruits."

10. The following insects and diseases, and such others as may from time to time be designated by the board, are within the meaning of this act designated as "dangerous:"

1. San Jose scale (*Aspidiotus perniciosus*).
2. The woolly aphid of apple (*Schizoneura lanigera*).
3. Oyster-shell bark-louse (*Mytilaspis pomorum*).
4. Plum-knot of plum and cherry (*Plowrightia morbosa*).
5. Crown gall (*Dendrophagus globosus*).

11. The professor of botany and zoology in the State university, who is at present the secretary of the board, shall act as its chief inspector of fruit pests. The four appointive members of the board are the inspectors for their respective horticultural districts. Each in his own district may be delegated by the chief inspector to reinspect any shipment into the State upon its arrival if, for any reason, it may be deemed necessary in order to protect the interests of the State. It shall be their further duty to keep themselves informed, as far as possible, concerning the operation and enforcement of the regulations of the board and to communicate such information to the secretary, each cooperating in the fullest measure in order that the greatest impetus and service may be rendered to the horticultural interests of Wyoming.

12. In order that the benefits contemplated by this act may accrue to the State in the fullest measure, fruit growers and owners of even the smallest orchards are earnestly requested to report to the secretary of the board the conditions of their orchards. If insects or fungous diseases have found entrance, it will be the duty of the secretary to cooperate with the owner for the extermination or eradication of such insects or diseases. To that end printed directions for the treatment of infested or infected trees will be sent, and all other available information will be supplied.

SUMMARY OF REQUIREMENTS TO BE COMPLIED WITH BY NURSERYMEN OR OTHERS WHO MAKE INTERSTATE SHIP- MENTS OF NURSERY STOCK.^a

For the information of nurserymen or other persons who desire to ship nursery stock to points outside the States in which their nurseries are located, a brief statement of the requirements is given herewith. Changes are continually being made on account of the enactment of new laws or the amendment of old ones, and modifications of the regulations of different States are made from time to time by the authorities in charge of the enforcement of the laws. For the convenience of nurserymen who may wish to write to the officials in charge of inspection work the names and addresses of the latter are given.

Alabama.—Persons shipping stock into the State must file a signed duplicate certificate of inspection and obtain official tags, which must be placed on each shipment, in addition to a copy of the certificate. Cost of tags, 60 cents per hundred, or \$2.25 per thousand. Five cents per hundred must be added for postage. Mr. R. S. Mackintosh, State horticulturist, Auburn, Ala. (Act of 1903.)

Arizona.—No nursery-inspection law.

Arkansas.—Shipments must bear a certificate of inspection. Mr. C. F. Adams, State inspector, Fayetteville, Ark. (Act of 1903.)

California.—Shipments of stock sent into the State are subject to inspection and must bear the name of the consignor and consignee and a statement of where the stock was grown. Notice of shipments should be made to Hon. Ellwood Cooper, commissioner of horticulture, Sacramento, Cal.

Colorado.—Stock subject to inspection by county inspectors, who are appointed by the State board of horticulture, Denver, Colo. (Amended act of 1897.)

Connecticut.—Shipments of stock into the State must bear certificates of inspection issued by a State or Government officer, and a statement by the owner that they have been thoroughly fumigated. Dr. W. E. Britton, State entomologist, New Haven, Conn. (Amended act of 1903.)

Delaware.—Shipments into the State must be accompanied with official certificates of inspection. Mr. Wesley Webb, Dover, Del. (Amended act of 1901.)

Florida.—No law. Inspections made and certificates issued to local nurserymen by Prof. E. H. Sellards, entomologist, Agricultural Experiment Station, Lake City, Fla.

Georgia.—Shipments into the State must be accompanied with certificates of inspection and copies of the official tags of the State board of entomology. These may be obtained by submitting a duplicate of the official certificate of inspection and a statement that all stock shipped into the State will be properly fumigated. Tags are furnished at cost. Mr. R. I. Smith, State entomologist, Atlanta, Ga. (Act of 1900.)

^a Drafted by Mr. A. F. Burgess, secretary of the American Association of Horticultural Inspectors, from the foregoing collection of State and Territorial laws against injurious insects. (Published in separate form as Circular No. 75 of this Bureau.)

Hawaii.—Shipments are subject to the regulations of the board of commissioners of agriculture and forestry and are subject to inspection and quarantine on arrival at Honolulu, which is the only port where they are allowed to be landed. For application blanks for inspection and special information, address Hon. C. S. Holloway, secretary, Honolulu, Hawaii.

Idaho.—Persons desiring to sell or ship stock into this State must file a bond in the sum of one thousand dollars (\$1,000) with the State board of horticulture, conditioned on the faithful compliance with the requirements of the law, and secure a permit to do business in the State. Shipments must bear official certificates of fumigation, and the name of the grower and consignee must appear on the package. Mr. A. F. Hitt, State horticultural inspector, Boise, Idaho.

Illinois.—Shipments into the State must be accompanied with certificates of inspection. Dr. S. A. Forbes, State entomologist, Urbana, Ill. (Act of 1899.)

Indiana.—Shipments sent into the State must be accompanied with certificates of inspection for the current year. Prof. J. Troop, State entomologist, Lafayette, Ind. (Act of 1899.)

Iowa.—Shipments sent into the State must be accompanied with official certificates of inspection. Prof. H. E. Summers, State entomologist, Ames, Iowa. (Act of 1898.)

Kansas.—No law. Inspections of local nurseries made and certificates issued by Prof. E. A. Popenoe, State nursery inspector, Manhattan, Kans.

Kentucky.—Shipments into the State must be accompanied with official certificates of inspection. Prof. H. Garman, State entomologist, Lexington, Ky. (Act of 1897.)

Louisiana.—Shipments sent into the State must be accompanied with certificates of inspection. Mr. Wilmon Newell, State entomologist, Baton Rouge, La. (Act of 1903.)

Maine.—Shipments sent into the State must bear official certificates of inspection or affidavits that the contents have been fumigated in a manner approved by the State inspector at the shipping point. Hon. A. W. Gilman, commissioner of agriculture, Augusta, Me. (Act of 1905.)

Maryland.—Stock sent into the State must bear the name of the consignor and consignee and a certificate of inspection. Duplicate certificates should be filed with the State entomologist. Prof. T. B. Symons, State entomologist; Prof. J. B. S. Norton, State pathologist, College Park, Md. (Act of 1898.)

Massachusetts.—Stock sent into the State must bear a certificate of inspection or an affidavit of fumigation. Dr. H. T. Fernald, State nursery inspector, Amherst, Mass. (Act of 1902.)

Michigan.—Nurserymen selling stock in this State must pay a license fee of five dollars (\$5) and furnish a bond of one thousand dollars (\$1,000), with satisfactory sureties. Shipments must be accompanied with certificates of inspection, and if of species subject to the attack of the San Jose scale certificates by the nurserymen that the stock has been properly fumigated. Prof. L. R. Taft, State inspector of orchards and nurseries, Agricultural College, Mich. (Act of 1897.)

Minnesota.—Stock shipped into the State must bear a certificate of inspection. Prof. F. L. Washburn, State entomologist, St. Anthony Park, Minn. (Act of 1903.)

Mississippi.—No nursery-inspection law.

Missouri.—Stock shipped into the State must be accompanied with official certificates of inspection. Prof. J. M. Stedman, State entomologist, Agricultural experiment station, Columbia, Mo.

Montana.—Before selling stock in the State a license must be secured, which will be issued on the payment of a fee of twenty-five dollars (\$25), and a bond of one thousand dollars (\$1,000) must be filed. Stock shipped into this State will be unpacked and fumigated at quarantine stations. Previous notice of all shipments should be sent to Mr. Fred Whiteside, secretary, State board of horticulture, Butte, Mont. (Act of 1899.)

Nebraska.—No nursery-inspection law. Local nurseries inspected and certificates issued by Prof. Lawrence Bruner, acting State entomologist, Lincoln, Nebr.

Nevada.—No law.

New Hampshire.—Stock shipped into the State must bear a certificate of inspection or a statement containing an affidavit that it has been properly fumigated. Prof. E. D. Sanderson, State nursery inspector, Durham, N. H. (Act of 1903.)

New Jersey.—Stock shipped into the State must be accompanied with a certificate of inspection and a statement from the shipper that it is a part of the stock inspected and whether it has been fumigated with hydrocyanic-acid gas. Dr. John B. Smith, State entomologist, New Brunswick, N. J. (Act of 1903.)

New Mexico.—No law relating to nursery inspection.

New York.—Nursery stock shipped into the State must be accompanied with an official certificate of inspection and must be fumigated before being sold or planted. Hon. Charles A. Wieting, commissioner of agriculture, Albany, N. Y. (Act of 1903.)

North Carolina.—Shipments sent into this State must bear official certificates of inspection, and should be fumigated and a statement to that effect signed and attached by the consignor. Duplicate certificates must be filed with the State entomologist. Franklin Sherman, jr., State entomologist, Raleigh, N. C. (Act of 1897.)

North Dakota.—No law.

Ohio.—Shipments must be accompanied with official certificates of inspection or fumigation. Agents and dealers must file sworn statements as to the sources from which their stock is obtained. Mr. A. F. Burgess, chief inspector, department of agriculture, Columbus, Ohio.

Oklahoma.—The owners of nurseries who wish to ship stock into the Territory are required to make an application for a permit. A statement is then secured from the inspector who examined the stock, and if this is satisfactory a permit is issued. Shipments must be accompanied with copies of the official certificate and the official tags of the Oklahoma board of agriculture. Tags are furnished for 75 cents for the first hundred and 30 cents for each additional hundred. Agents are required to carry a copy of the permit of their principals and a statement from said principals that they are authorized to transact business. Hon. C. A. McNabb, secretary, board of agriculture, Guthrie, Okla. (Act of 1905.)

Oregon.—Stock subject to inspection on arrival at quarantine stations. Mr. George H. Lamberson, secretary, State board of horticulture, Portland, Oreg. (Amended act of 1905.)

Pennsylvania.—All shipments entering the State must be accompanied with certificates of inspection and certificates of fumigation. Prof. H. A. Surface, State zoologist, Harrisburg, Pa. (Act of 1905.)

Porto Rico.—Nursery stock will be received only through three ports of entry, namely, San Juan, Ponce, and Mayaguez, and must be accompanied with an official certificate of inspection. It is subject to inspection by local inspectors on arrival at said ports of entry. Inspectors are appointed by the governor.

Rhode Island.—Shipments must be accompanied with certificates of inspection or affidavits of fumigation. Mr. A. E. Stene, State nursery inspector, Kingston, R. I. (Act of 1904.)

South Carolina.—A duplicate certificate of inspection must be filed with the State entomologist and an official tag of the State board of entomology secured by nurserymen desiring to ship stock into the State. This tag and an official certificate of fumigation must be attached to all shipments. Prof. C. E. Chambliss, State entomologist, Clemson College, S. C. (Act of 1903.)

South Dakota.—Shipments must be accompanied with certificates of inspection. Prof. W. A. Wheeler, State entomologist, Brookings, S. Dak. (Act of 1905.)

Tennessee.—Stock shipped into the State must bear a certificate of inspection. Duplicate certificate must be filed with Prof. H. A. Morgan, State entomologist, Knoxville, Tenn. (Act of 1905.)

Texas.—Duplicate certificates of inspection must be filed, and all shipments must bear certificates of inspection. Hon. W. J. Clay, commissioner of agriculture, Austin, Tex. (Act of 1905.)

Utah.—Stock shipped into the State must bear a certificate stating that it has been properly fumigated before shipping. Hon. C. A. Hickenlooper, secretary, State board of horticulture, Salt Lake City, Utah. (Act of 1905.)

Vermont.—No law.

Virginia.—Duplicate certificates of inspection must be filed by nurserymen shipping stock into the State and official tags obtained from the board of crop pest commissioners; also a registration fee of twenty dollars (\$20) must be paid. Tags furnished at cost. Mr. J. L. Phillips, State entomologist, Blacksburg, Va. (Amended act of 1903.)

Washington.—Before soliciting or engaging in selling nursery stock in this State a bond of one thousand dollars (\$1,000) and a license fee of five dollars (\$5) must be paid by nurserymen and a license fee of two dollars and fifty cents (\$2.50) by agents and dealers. Notice must be sent previous to the shipment of stock, giving the names of the nurserymen and the places at which it is to be delivered. Mr. A. Van Holderbeke, commissioner of agriculture, Tacoma, Wash. (Amended act of 1905.)

West Virginia.—All stock shipped into the State must be accompanied with an official certificate of inspection and a statement by the nurseryman that it has been properly fumigated. Agents or dealers who sell stock must secure a license from the assessor in the county where the stock is sold and pay a fee of ten dollars (\$10) to the sheriff of the county. Prof. J. H. Stewart, director, agricultural experiment station, Morgantown, W. Va. (Amended acts of 1903 and 1905.)

Wisconsin.—Stock shipped into the State must bear an official certificate of inspection. Prof. E. P. Sandsten, agricultural experiment station, Madison, Wis. (Act of 1899.)

Wyoming.—Any person or firm wishing to do business in the State must first obtain a license. Licenses are issued on application for a period terminating on July 1 of the next succeeding inspection year (approximately two years). All applications must be accompanied by the license fee (\$25), a bond in the sum of five hundred dollars (\$500) conditioned that the principal will faithfully obey the law of the State of Wyoming, and by a certified certificate of inspection from an authorized inspector in the State from which shipments are to be made. On receipt of these the secretary of the State board issues authorized shipping tags (at cost). Nursery stock may not enter the State and transportation companies may not deliver unless such tags be attached to each and every

box, bundle, or bale. The presence of the shipping tag shall be taken as prima facie evidence of inspection, and no further inspection is required, though the board reserves the right to reinspect, if for any cause it may deem it wise to do so. For circular of detailed information address Prof. Aven Nelson, secretary, State board of horticulture, Laramie, Wyo. (Act of 1905.)

Canada.—Shipments of stock into Canada are unpacked and fumigated by Government inspectors and must arrive within the time specified at the following ports of entry: St. John, New Brunswick; St. Johns, Quebec; Niagara Falls and Windsor, Ontario; Winnipeg, Manitoba, from March 15 to May 15 and from October 7 to December 7. At Vancouver, British Columbia, from October 15 to March 15. Dr. James Fletcher, Dominion entomologist, Ottawa, Ontario.

STATE AND TERRITORIAL LAWS RELATIVE TO FOUL BROOD.

CALIFORNIA.

CHAPTER XXIV.

AN ACT to promote the apicultural interests of the State of California by providing county inspectors of apiaries, and defining their duties, and providing for their compensation, and repealing the act entitled "An act to authorize the board of supervisors of the several counties of this State to appoint inspectors of apiaries, and provide for their compensation, and defining their duties, and for the further protection of bee culture," approved March 13, 1883.

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. Whenever a petition is presented to the board of supervisors of any county, signed by ten or more persons, each of whom is a property holder resident of the county, and possessor of an apiary or place where bees are kept, stating that certain or all apiaries within the county are infected with the disease known as "foul brood," or any other disease which is infectious or contagious in its nature, and injurious to the bees, their eggs or larvæ, and praying that an inspector be appointed by them, whose duty it shall be to supervise the treatment of said bees and apiaries as herein provided, the board of supervisors shall, within twenty (20) days thereafter, appoint a suitable person, who shall be a skilled bee keeper, inspector of apiaries. Upon petition of ten persons, each of whom is a resident property holder and possessor of an apiary, the board of supervisors may remove said inspector for cause, after a hearing of the petition.

SEC. 2. It shall be the duty of the inspector in each county to cause an inspection to be made, when he deems it necessary, of any or every apiary, or other place within his jurisdiction in which bees are kept, and if found infected with foul brood, or any other infectious or contagious disease injurious to the bees, or their eggs, or larvæ, he shall notify the owner or owners, person or persons in charge, or in possession of said apiaries or places where bees are kept, that the same are infected with foul brood, or any other disease infectious or contagious in its nature, and injurious to bees, their eggs or larvæ, and he shall require such person or persons to eradicate and remove such disease or cause of contagion within a certain time to be specified. Said notice may be served upon the person or persons, or either of them, owning or having charge, or having possession of such infected apiaries, or places where bees are kept, by any inspector, or by any person deputed by the said inspector for that purpose, or they may be served in the same manner as a summons in a civil action. Any and all such apiaries, or places where bees are kept, found infected with foul brood, or any other infectious or contagious disease are hereby adjudged and declared to be a public nuisance; and whenever any such nuisance shall exist at any place within his jurisdiction, or on the property of any nonresident, or on any property the owner or owners of which cannot be found by the inspector, after diligent search, within the county, or upon the property of any

owner or owners upon whom notice aforesaid has been served, and who shall refuse or neglect to abate the same within the time specified, it shall be the duty of the inspector to abate the same, either by treating the disease or by destroying the infected hives, together with their combs and bees therein. The expense thereof shall be a county charge, and the board of supervisors shall allow and pay same out of the general fund of the county.

SEC. 3. It shall be the duty of the county inspector of apiaries to keep a record of his official acts and doings, and make a monthly report thereof to the board of supervisors; and the board of supervisors may withhold warrants for salary of said inspector until such time as said report is made.

SEC. 4. The salary of the county inspector of apiaries shall be three dollars per day when actually engaged in the performance of his duties.

SEC. 5. An act entitled "An act to authorize the board of supervisors of the several counties of this State to appoint inspectors of apiaries, and provide for their compensation, and defining their duties, and for the further protection of bee culture," approved March thirteenth, eighteen hundred and eighty-three, is hereby repealed.

SEC. 6. This act shall take effect and be in force from and after its passage.

Approved February 20, 1901.

CHAPTER VI.

AN ACT to amend section four of an act entitled "An act to promote the apicultural interests of the State of California by providing county inspectors of apiaries, and defining their duties, and providing for their compensation, and repealing the act entitled 'An act to authorize the board of supervisors of the several counties of this State to appoint inspectors of apiaries, and provide for their compensation, and defining their duties, and for the further protection of bee culture,' approved March 13, 1883," said first-named act having been approved February 20, 1901, and adding five new sections to said act, to be numbered and designated as sections seven, eight, nine, ten, and eleven, and providing for making the violation of certain sections thereof a misdemeanor.

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. Section four of an act entitled "An act to promote the apicultural interests of the State of California by providing county inspectors of apiaries, and defining their duties, and providing for their compensation, and repealing the act entitled 'An act to authorize the board of supervisors of the several counties of this State to appoint inspectors of apiaries, and provide for their compensation, and defining their duties, and for the further protection of bee culture,' approved March thirteenth, eighteen hundred and eighty-three," approved February twentieth, nineteen hundred and one, is hereby amended so as to read as follows:

SEC. 4. The salary of the county inspector of apiaries shall be four dollars per day when actually engaged in the performance of his duties, and itemized necessary traveling expenses incurred in the performance of his duties as prescribed in this act.

SEC. 2. There is hereby added to said act five new sections, to be numbered and designated as section seven, section eight, section nine, section ten, and section eleven, and to read as follows:

"SEC. 7. The inspector of apiaries may, in his discretion, order the owner or owners or other person in charge of bees kept in box or other immovable or stationary comb hives in apiaries infected with foul brood or any other infectious or contagious disease or within a radius of three miles of such diseased

apiaries to transfer such bees to movable-frame hives within a reasonable time, to be specified in such order or notice, and in default of such transfer by the owner or owners or other person in charge of such bees, the inspector may destroy, or cause to be destroyed, all such hives, together with their contents, and the expense thereof shall be a county charge, as provided in section two of this act.

"SEC. 8. Any person or persons who shall import bees into the State of California, which said bees are not accompanied with a certificate from a duly authorized inspector of apiaries or bee inspector, certifying that such bees are free from foul brood and other infectious or contagious diseases, or who shall import bees from another county within this State not having a bee inspector into a county having a bee inspector, shall immediately upon the receipt of such bees cause them to be inspected by a duly authorized inspector of apiaries, and if such bees are found to be infected with foul brood or other infectious or contagious disease such inspector shall proceed to have such disease eradicated as provided in section two of this act. Any person violating the provisions of this section shall be deemed guilty of a misdemeanor.

"SEC. 9. It shall be unlawful for any person owning or controlling bees within this State which are known to be infected with foul brood or other infectious or contagious disease to remove said bees to a new location without first giving ten days' notice to the county inspector of apiaries, stating when and where he intends moving said bees. Any person violating the provisions of this section shall be deemed guilty of a misdemeanor.

"SEC. 10. Any person or persons whose apiary is infected with foul brood or any other infectious or contagious disease, and who sells, or offers for sale, from such infected apiary and bees, hives, bee fixtures, or appurtenances, or who shall expose in his bee yard or elsewhere any infected comb honey, beeswax, or other infected thing, or who conceals the fact that his apiary is so infected shall be deemed guilty of a misdemeanor.

"SEC. 11. Any person or persons who shall resist, impede, or hinder in any way the inspector of apiaries in the discharge of his duties under the provisions of this act shall be deemed guilty of a misdemeanor."

SEC. 3. This act shall take effect immediately.

Approved February 10, 1903.

COLORADO.

SECTION 1. Upon the written application, under oath, of the president or secretary of the Colorado State Bee Keepers' Association, or of any five actual bee keepers residing in any county in this State, alleging upon information and belief that the disease known as foul brood, or any other contagious or infectious disease, exists among the bees in said county, or that infected articles are kept in said county, and that there is danger that such disease will spread to other apiaries, being made to the county court of said county, or to the judge thereof at chambers, the said court or judge shall, by order to be entered in the records of said court, appoint some competent, actual bee keeper residing in said county to be county inspector of bees; and the applicants shall state in this application the names of the actual bee keepers of the county, so far as known to them.

SEC. 2. The person so appointed shall, within five days after his appointment, file with the clerk of such court his written acceptance of the office, and the usual oath of office; or in default thereof, the judge or court shall, in the same manner, make new appointments until the said office is filled. The inspector

shall hold his office during the pleasure of the court, and until his successor is appointed and qualified.

SEC. 3. Every bee keeper or other person who shall be aware of the existence of foul brood, either in his own apiary or elsewhere, shall immediately notify the county inspector of bees, if there be one, and if not, the secretary of the Colorado State Bee Keepers' Association, of the existence of such disease, and in default of so doing shall, on summary conviction before a justice of the peace, be liable to a fine of five dollars and costs.

SEC. 4. On receiving notice from any source of the existence, in any apiary in his county, of the disease known as foul brood, or any other infectious or contagious disease of bees, the county inspector of bees shall forthwith inspect each colony of bees and all hives, implements and apparatus, honey and supplies on hand or used in connection with such apiary, or otherwise distinctly designate each colony and apiary which he believes infected, and notify the owner or person in charge of said bees thereof, in writing or otherwise, and the owners of said bees, or person in charge thereof, shall, within five days thereafter, practically and in good faith apply and thereafter fully and effectually carry out to and upon such diseased colonies such treatment as may have been prescribed by the Colorado State Bee Keepers' Association for such cases; also thoroughly disinfect, to the satisfaction of such inspector, all hives, bee houses, combs, honey, and apparatus that have been used in connection with any such diseased colonies; or, at his election, the said owner or person in charge of such bees may, within the same time, utterly and completely destroy said bees, hives, house, comb houses, honey, and apparatus by fire, or bury the same in the ground with a covering of not less than two feet of earth.

SEC. 5. After inspecting infected hives or fixtures, or handling diseased bees, the inspector shall, before leaving the premises or proceeding to any other apiary, thoroughly disinfect his own person and clothing, and shall see that any assistant or assistants with him have also thoroughly disinfected their person and clothing.

SEC. 6. The inspector shall have full power, in his discretion, to order any owner or possessor of bees dwelling in box hives in apiaries where the disease exists (being mere boxes without frames) to transfer such bees to movable frame hives within a specified time, and in default of such transfer the inspector may destroy, or order the destruction of, such box hives and the bees dwelling therein.

SEC. 7. Should the owner or possessor of diseased colonies of bees, or any portion of said colonies, be they queens or workers, or of any affected appliances of bee keeping, knowingly sell or barter, or give away, or move or allow to be moved, such diseased colonies, or portion of colonies, or infected appliances, he shall, on conviction before any justice of the peace, be liable to a fine of not less than \$50 nor more than \$100, or to imprisonment in the county jail for any term not exceeding two months.

SEC. 8. Should any person whose bees have been destroyed or treated for foul brood sell, or offer for sale, any bees, hives, or appurtenances of any kind, after such destruction or treatment, and before being authorized by the inspector to do so, or should he expose, in his bee yard or elsewhere, any infected comb honey, or other infected thing, or conceal the fact that said disease exists among his bees, he shall, on conviction before a justice of the peace, be liable to a fine of not less than \$20 nor more than \$50, or to imprisonment in the county jail for a term not exceeding two months and not less than one month.

SEC. 9. When an owner or possessor of bees shall disobey the directions of the said inspector, a justice of the peace may, upon the complaint of the said

inspector, cause a sufficient number of special constables to be sworn in, and such special constables shall proceed to the premises of such owner or possessor and assist the inspector to seize all diseased colonies and affected appurtenances and burn them forthwith, and, if necessary, the said constables may arrest the said owner or possessor and bring him before a justice of the peace, to be dealt with according to the provisions of the preceding sections of this act.

SEC. 10. Before proceeding against any person before any justice of the peace, the said inspector shall read over to such person the provisions of this act, or shall cause a copy thereof to be delivered to such person.

SEC. 11. The said inspector shall include in his annual report to the president of the Colorado State Bee Keepers' Association, a statement of his work during the preceding year, which statement shall include: First, the number of colonies inspected; second, the number of colonies diseased; third, the number of colonies destroyed by fire or otherwise; fourth, the names of the owners and the localities where found; fifth, the amount paid him for his services and expenses for the preceding year.

SEC. 12. The county inspector of bees of each county shall receive a per diem allowance of four dollars for each full day, and two dollars for each half day, necessarily and actually employed in the discharge of his duties under this act, together with his necessary and actual expenses while so employed, to be audited, allowed, and paid by the county officers in the same manner as other claims against the county.

SEC. 13. All acts and parts of acts in conflict with this act are hereby repealed.

SEC. 14. In the opinion of the general assembly an emergency exists, and this act shall take effect from and after its passage.

Approved April 6, 1891.

IDAHO.

AN ACT to suppress infectious and contagious diseases of bees, to provide for an inspector of bees, defining his powers and duties, and to define certain misdemeanors, and providing punishment therefor.

Be it enacted by the legislature of the State of Idaho:

SECTION 1. The State horticultural inspector shall be ex officio State bee inspector, whose duties it shall be, either by himself or duly qualified and competent deputies, to examine bees of the State and to treat, condemn, and utterly destroy by fire or by burying at least two feet under ground all bees, honey, and fixtures found to be affected with foul brood or other infectious or contagious disease.

SEC. 2. Upon the application of the president and secretary of any bee association or upon petition of three bee keepers of any horticultural inspection district in the State, the State bee inspector may appoint deputy bee inspectors for the district from which such application or petition comes; and such deputy shall have the same powers and duties within his district as the State bee inspector, and the tenure of his office shall be concurrent with that of the State bee inspector, unless sooner dismissed.

SEC. 3. It shall be the duty of the State bee inspector or his deputy upon receiving information from any source of the existence, in any apiary in his district, of the disease known as foul brood, or any other infectious or contagious disease of bees, to forthwith inspect each colony of bees and all hives, implements and apparatus, honey, and supplies on hand or used in connection with

such apiary, or otherwise distinctly designate each colony and apiary which he believes infected, and notify the owner or person in charge of said bees thereof, in writing or otherwise, and the owners of said bees, or the person in charge thereof, shall, within five days thereafter, practically and in good faith, apply and thereafter fully and effectually carry out to and upon such diseased colonies such treatment as may have been prescribed by the inspector of bees for such cases; also thoroughly disinfect, to the satisfaction of such inspector, all bee hives, combs, honey, and apparatus that have been used in connection with any such diseased colonies; or, at his election, the said owner or person in charge of such bees may, within the same time, utterly and completely destroy such bees, hives, house, comb houses, honey, and apparatus by fire, or bury the same in the ground, with a covering of not less than two feet of earth.

SEC. 4. Every bee keeper or other person who shall be aware of the existence of foul brood, either in his own apiary or elsewhere, shall immediately notify the inspector of bees of the existence of such disease, and in default of so doing shall be guilty of a misdemeanor and punishable by a fine of not more than five dollars and costs.

SEC. 5. The inspector of bees shall have the right to enter the premises of any bee keeper where bees are kept and inspect such bees; and any person resisting or refusing to allow such inspection by said bee inspector shall be guilty of a misdemeanor, and may be then and there arrested by the said bee inspector or person deputized by him, and brought before a justice of the peace, and upon conviction shall be fined not less than ten dollars nor more than twenty-five dollars.

SEC. 6. If any owner or keeper of bees knows of, or after being notified by the bee inspector that foul brood or other infectious or contagious disease exists in any of the hives in the apiary owned by or in charge of said person and shall fail to comply within ten days from receiving said knowledge, and the date of receiving instructions from the bee inspector to cure or destroy the bees or hives or their appliances, such person shall be guilty of a misdemeanor, and upon conviction thereof such person shall be fined not less than ten dollars nor more than twenty-five dollars.

SEC. 7. When the owner or possessor of bees shall disobey the directions of said inspector in curing or destroying any diseased bees, honey, hives, or appliances, they shall become unlawful and a public nuisance, and the said bee inspector shall at once destroy said bees, honey, hives, or appliances and may deputize such additional persons as he may find necessary to effect such destruction.

SEC. 8. Should any person whose bees have been destroyed or treated for foul brood sell or offer for sale any bees, hives, or appurtenances of any kind after such destruction or treatment or before being authorized by the inspector to do so, or should he expose, in his bee yard or elsewhere, infected comb, honey, or other infected thing, or conceal the fact that said disease exists among his bees, he shall be guilty of a misdemeanor and punishable by a fine of not less than ten dollars nor more than fifty dollars.

SEC. 9. Any person, persons, company, or corporation who shall bring into the State of Idaho any apiary, colony, or colonies of bees shall immediately notify the State or deputy inspector of bees of such fact, stating where any such colony or colonies are being kept, and it shall be the duty of the State or deputy inspector to proceed to examine such colony or colonies and ascertain whether or not they are free from foul brood or other infectious or contagious disease. Any person, persons, company, or corporation who shall fail to notify the State or deputy bee inspector, as required by this section, for a period of

ten days after the arrival within the State of Idaho of such colony or colonies of bees shall be guilty of a misdemeanor and punishable by a fine of not less than fifty dollars nor more than one hundred dollars.

SEC. 10. The inspector shall have full power, in his discretion, to order any owner or possessor of bees dwelling in box hives in apiaries where the disease exists (being mere boxes without movable frames) to transfer such bees to movable frame hives within a specified time, and in default of such transfer the inspector may destroy or order the destruction of such box hives and the bees dwelling therein.

SEC. 11. After inspecting infected hives or fixtures or handling diseased bees the inspector shall, before leaving the premises or proceeding to any other apiary, thoroughly disinfect his own person and clothing, and shall see that any assistant or assistants with him have also thoroughly disinfected their persons and clothing.

SEC. 12. The State bee inspector shall make an annual report to the governor of Idaho, giving the number of apiaries visited, the number of diseased apiaries found, the number of colonies treated, also the number of colonies destroyed and statistics bearing on the bee industries.

SEC. 13. All acts and parts of acts in conflict with this act are hereby repealed.

SEC. 14. Whereas an emergency existing therefor, this act shall take effect and be in force from and after its passage and approval.

MICHIGAN.

ACT 66, 1901, PAGE 97. .

The people of the State of Michigan enact:

SECTION 1. The dairy and food commissioner, upon receipt of a certified copy of the record of the Michigan State Bee-Keepers Association by the secretary of said association, showing that a majority of the members of said association recommended the appointment of an inspector of apiaries, shall appoint a State inspector of apiaries. Said inspector shall be responsible to the dairy and food commissioner, and shall comply with such rules and regulations as the dairy and food commissioner shall from time to time prescribe for the carrying out of the work of said State inspector.

SEC. 2. The dairy and food commissioner shall, when notified in writing by the owner of an apiary or by three disinterested taxpayers in the vicinity of the apiary, cause the inspector to examine such apiaries as are reported and all others in the same locality not reported, and ascertain whether or not the disease known as foul brood or other contagious disease exists in such apiaries, and if satisfied of the existence of foul brood he shall give the owner or caretaker of the diseased apiaries full instructions how to treat said case as in the inspector's judgment seems best.

SEC. 3. The inspector, who shall be the sole judge, may visit all diseased apiaries a second time and, if need be, burn all colonies of bees and combs that may be found not cured of foul brood or other contagious diseases.

SEC. 4. If the owner of a diseased apiary, honey, or appliances shall knowingly or wilfully sell, barter, or give away any bees, honey, or appliances, or expose other bees to the danger of said disease, or refuse to allow said inspector to inspect such apiary, honey, or appliances, said owner shall on conviction before a justice of the peace be liable to a fine of not less than fifty dollars

nor more than one hundred dollars, or not less than one month's imprisonment in the county jail nor more than two months' imprisonment.

SEC. 5. In addition to such individual reports as are required under this act by the inspector of apiaries, he shall make an annual report to the dairy and food commissioner, giving the number of apiaries visited, the number of diseased apiaries found, the number of colonies treated, also the number of colonies destroyed by fire, and an itemized account of his transportation expenses, with affidavit annexed thereto.

SEC. 6. There is hereby appropriated, out of any moneys in the State treasury not otherwise appropriated, a sum not exceeding five hundred dollars per year for the suppression of foul brood among bees in Michigan. The inspector shall receive three dollars per day and actual transportation expenses for actual time served, which sum shall not exceed the money hereby appropriated, to be paid by the State treasurer upon warrants drawn by the auditor-general and approved by the dairy and food commissioner.

SEC. 7. Act number one hundred forty-one of the public acts of eighteen hundred eighty-one, being sections fifty-six hundred sixty-three, fifty-six hundred sixty-four, fifty-six hundred sixty-five, fifty-six hundred sixty-six, fifty-six hundred sixty-seven, fifty-six hundred sixty-eight, fifty-six hundred sixty-nine, and fifty-six hundred seventy of the compiled laws of eighteen hundred ninety-seven, is hereby repealed.

This act is ordered to take immediate effect.

NEBRASKA.

CHAPTER 82.—BEES.

SECTION 1. It shall be unlawful for any person to keep or have in possession in this State any honeybees, brood comb, or honey known to possess or be infected with the disease known as "foul brood," or with any other infectious or contagious disease peculiar to bees and honey, contrary to the provisions of this act, or to keep or to have in possession any beehive or other receptacle in which foul brood, diseased bees, or infected honey is known to have been kept. Every person violating any provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall pay a fine of not less than ten dollars nor more than one hundred for each offense, or be confined in the county jail not more than thirty days.

SEC. 2. Any honeybees, brood comb, or honey owned or kept or found in this State known to be affected with foul brood or other infectious or contagious disease, and any beehive or receptacle in which any bees, brood comb, or honey shall have been kept, known to have been infected with any infectious or contagious disease, shall be destroyed immediately and completely by burning, by the owner thereof or the person or persons in whose possession the same may be.

SEC. 3. Every person owning or having in his or her possession, or under his or her control, any honeybees, brood comb, honey, beehive, or receptacle or apparatus known to be infected with any infectious or contagious disease peculiar to honeybees or honey, or in which any diseased bees or infected honey shall have been kept, who shall not immediately cause the same to be destroyed as provided in section 2 of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall pay a fine of not less than ten dollars nor more than one hundred dollars for each offense, or be imprisoned in the county jail not more than thirty days for each offense.

SEC. 4. Every person owning or keeping honeybees in this State shall cause all bees owned or kept by him or her to be inspected at his or her own expense as hereinafter provided. Every person neglecting or refusing to cause all such bees to be duly inspected as hereinafter provided shall be deemed guilty of a misdemeanor, and shall pay a fine of not less than ten dollars nor more than one hundred dollars for each offense upon conviction thereof: *Provided*, That if upon inspection of any colony or colonies of bees the disease of foul brood or other infection or contagion shall be found to exist, and such inspector shall be of the opinion that by proper treatment such disease or contagion or infection may be removed, he shall so certify officially in his certificate of inspection, and the owner or owners of such bees shall be entitled to keep such bees for the period of six months for treatment, and at the expiration of said time, if such disease, infection, or contagion shall not be eradicated, such bees shall be destroyed, as hereinbefore provided, and any person or persons having in possession any brood, comb, beehives, honey, or apparatus used in connection with bee culture, found in like manner to be infected with foul brood or infectious or contagious disease, such person shall be allowed the period of thirty days to disinfect the same, but no longer, and if at the end of said period of thirty days said disinfection shall not have been complete, such brood, comb, beehive, honey, or apparatus shall be destroyed as hereinbefore provided.

SEC. 5. Every person engaged in beekeeping in this State, either as owner, agent, or lessee, in infected districts, shall cause to be inspected at least once in each year each and every brood or colony of bees, brood comb, and honey in his or her possession or under his or her control, and procure a certificate of such inspection showing the true condition of each and every one of the above-named articles in his or her possession as to the existence of foul brood or other infectious or contagious disease, in duplicate, one of which duplicates shall be left with such person and the other shall be filed in the office of the county clerk of the county where such bees or honey or brood comb is kept.

SEC. 6. Upon the application of the Nebraska State Beekeepers' Association, or other person or persons interested in bee culture residing in any county in this State, the governor may appoint a suitable person, resident of said county, inspector of bees and honey for said county, who shall be sworn to perform the duties of such office faithfully and impartially, whose duty it shall be to inspect all bees, brood combs, honey within his said county when called upon for said purpose, and shall be entitled to receive the sum of two dollars for each day or part of a day necessarily employed in making such inspection, to be paid by the owner or agent or lessee in whose possession such bees, brood comb, or honey may be when inspected. Such inspectors shall make certificates in duplicate, and shall give one to the owners or persons in charge of such bees, or brood combs, or honey, and file the other in the office of the county clerk as aforesaid.

Took effect June 6th, 1885.

NEW MEXICO.

CHAPTER 43.

AN ACT relating to foul brood and other contagious diseases among bees.

Be it enacted by the legislative assembly of the Territory of New Mexico:

SECTION 1. That hereafter all bee keepers, owners, and possessors of bees, apiaries, bee hives, and apparatus pertaining to bees, bee keepers, apiaries, and bee hives shall keep the same properly protected and disinfected and free from

all foul brood or other contagious diseases, and shall be required to keep all bees, bee hives, bee houses, apiaries, combs, honey, and apparatus free from all foul brood or other contagious diseases.

SEC. 2. That any person or persons who have in their possession or under their control any bees, bee hives, bee houses, combs, or apparatus pertaining to bees or apiaries and who shall allow the same to become infected or diseased with any foul brood or contagious diseases, and who shall wilfully and knowingly permit them to remain in such condition, shall be deemed guilty of misdemeanor and upon trial and conviction before any justice of the peace may be fined in any sum not less than ten dollars or more than fifty dollars, or by imprisonment in the county jail not more than 30 days, or by both such fine and imprisonment.

SEC. 3. That any person competent to testify as a witness may, upon information and belief, make complaint before any justice of the peace in any county in this Territory in which such foul brood or contagious diseases among bees is found to exist, and upon such written complaint being made in writing and duly sworn to as required by law the justice before whom such complaint is made shall issue a warrant for the arrest of the offender and shall fully inquire, examine into, and try said cause as now provided for the trial of misdemeanors before a justice of the peace.

SEC. 4. That upon the trial of said cause, that any bees, bee hives, combs, honey, or apparatus connected with said apiary or bee keeper that be found by said justice of the peace before whom such trial is had to be diseased or infected with foul brood or any other contagious diseases shall by such justice of the peace be declared to be a nuisance and shall be condemned as such and an order or writ issued for the destruction of such nuisance, and upon the issuing of such order and such writ directed to any constable or sheriff of such county such constable or such sheriff to whom such order or writ is directed and delivered shall forthwith execute the same by burning, destroying, and putting out of existence all such bees, bee hives, bee houses, comb, honey, or apparatus so declared to be and condemned as a nuisance.

SEC. 5. Justices of the peace in their respective counties shall have jurisdiction in all causes arising under the provisions of this act, and their costs in cases under this act shall be taxed up and assessed as cases in other cases of misdemeanor before justice of the peace.

SEC. 6. All acts and parts of acts in conflict herewith are hereby repealed, and this act shall take effect and be in force from and after its passage.

Approved March 9, 1905.

NEW YORK.

AGRICULTURAL LAW OF THE STATE OF NEW YORK, AS AMENDED TO JULY, 1905.

ARTICLE VI.

§ 80. *The prevention of diseases among bees.* No person shall keep in his apiary any colony of bees affected with a contagious malady known as foul brood or black brood; and every bee keeper, when he becomes aware of the existence of either of such diseases among his bees, shall immediately notify the commissioner of agriculture of the existence of such disease. (*As amended by chapter 214 of the Laws of 1902.*)

§ 80 a. [Defining honey.]

§ 80 b. [Relative to selling a commodity in imitation or semblance of honey.]

§ 81. *Duties of the commissioner.* The commissioner of agriculture shall immediately upon receiving notice of the existence of foul brood or black brood among the bees in any locality send some competent person or persons to examine the apiary or apiaries reported to him as being affected and all the other apiaries in the immediate locality of the apiary or apiaries so reported; if foul brood or black brood is found to exist in them, the person or persons so sent by the commissioner of agriculture shall give the owners or caretakers of the diseased apiary or apiaries full instructions how to treat said cases. The commissioner of agriculture shall cause said apiary or apiaries to be visited from time to time as he may deem best, and if, after proper treatment, the said bees shall not be cured of the diseases known as foul brood or black brood then he may cause the same to be destroyed in such manner as may be necessary to prevent the spread of the said diseases. For the purpose of enforcing this act the commissioner of agriculture, his agents, employees, appointees, or counsel, shall have access, ingress, and egress to all places where bees or honey or appliances used in apiaries may be which it is believed are in any way affected with the said disease of foul brood or black brood or where it is believed any commodity is offered or exposed for sale in violation of the provisions of this act. No owner or caretaker of a diseased apiary, honey, or appliances shall sell, barter, or give away any bees, honey, or appliances from said diseased apiary which shall expose other bees to the danger of said diseases, nor refuse to allow the said commissioner of agriculture, or the person or persons appointed by him, to inspect said apiary, honey, or appliances and do such things as the said commissioner of agriculture or the person or persons appointed by him shall deem necessary for the eradication of said diseases. Any person who disregards or violates any of the provisions of this section is guilty of a misdemeanor and shall be punished by a fine of not less than thirty dollars nor more than one hundred dollars, or by imprisonment in the county jail for not less than one month nor more than two months, or by both fine and imprisonment. (*As amended by chapter 214 of the Laws of 1902.*)

OHIO.

AN ACT to provide for county inspectors of apiaries and defining their duties, and providing for their compensation, for the purpose of curing and avoiding foul brood or other diseases among bees and their hives.

Be it enacted by the general assembly of the State of Ohio:

SECTION 1. That whenever a petition is presented to the board of county commissioners of any county in the State of Ohio, signed by three or more persons, all of whom are residents of said county, and possessors of an apiary or place where bees are kept, stating that certain apiaries within said county are infected with the disease known as foul brood, or any other disease which is injurious to bees or their larvæ, praying that an inspector be appointed by said board of county commissioners, said board of county commissioners shall within five days after the presentation of said petition appoint a person as bee inspector who is resident of said county who shall be a skilled bee keeper, having thorough knowledge of foul brood and other diseases injurious to bees and their larvæ and the treatment of same.

SEC. 2. The person so appointed shall, within five days after his appointment, file with the said board his written acceptance of the office, or, in default thereof,

or in case of vacancy, the board shall in the same manner make new appointments until the said office is filled. The inspector shall hold his office for two years and until his successor is appointed and qualified, except when upon petition of ten persons (each of whom is a resident of said county and possessor of an apiary), to the board of county commissioners of said county, may remove said inspector for cause, after a hearing of petitioners.

SEC. 3. Any bee keeper or other person who shall have cause to believe that an apiary in his county is affected with foul brood or other disease, either in his own apiary or elsewhere, shall make affidavit stating that on information or belief, he believes that certain apiaries, describing the location, naming the owner or keeper, is affected with foul brood or other disease, and his ground for such belief. On receiving said affidavit from any source of the existence in any apiary in his county, of the disease known as foul brood, or any other infectious or contagious disease of bees, the county inspector of bees shall forthwith inspect each colony of bees and all hives, implements and apparatus, honey and supplies on hand or used in connection with such apiary, and distinctly designate each colony or apiary which is infected, and notify the owner or person in charge of said bees thereof, in writing, and the owners of said bees, or the persons in charge thereof to practically and in good faith apply, and thereafter fully and effectually carry out to and upon such diseased colonies, such treatment as may have been prescribed by the said inspector for such cases; also thoroughly disinfect, to the satisfaction of the inspector, all hives, beehouses, combs, honey, and apparatus that have been used in connection with any such diseased colonies; or, at his election, the said owner or person in charge of such bees may within the same time utterly and completely destroy said bees, hives, houses, comb houses, honey, and apparatus by first killing the bees (by the use of sulphur fumes, when the bees are in the hives for the night), by fire, or bury the same in the ground with a covering of not less than two feet of earth.

SEC. 4. The inspector of bees shall have the right to enter the premises of any bee keeper, where the bees are kept, and inspect such bees, and any person resisting or refusing to allow said inspection by said bee inspector shall be guilty of a misdemeanor and may be then and there arrested by said bee inspector or person deputed by him and brought before a justice of the peace, and upon conviction shall be fined not less than ten dollars nor more than twenty-five dollars.

SEC. 5. After inspecting, working with, or handling infected hives or fixtures, or handling diseased bees, the inspector or other person shall, before leaving the premises, or proceeding to any other apiary, thoroughly disinfect his own person and clothing, and shall see that any assistant or assistants with him have also thoroughly disinfected their clothing and person.

SEC. 6. The inspector shall have full power in his discretion to order any owner or possessor of bees dwelling in box hives in apiaries where the disease exists (being mere boxes without frames) to transfer such bees to movable frame hives within a specified time, and in default of such transfer the same shall become unlawful and the inspector may destroy or order for destruction of such box hives and the bees dwelling therein as a public nuisance.

SEC. 7. Should any owner of, or keeper of, or other person having diseased bees or their larvæ, or of any affected hives of combs, appliances, or utensils for bee keeping, sell or barter or give away the same, or allow the same or any part thereof to be moved, such person shall be guilty of a misdemeanor, and upon conviction such person shall be fined not less than ten dollars nor more than twenty-five dollars.

SEC. 8. Should any person whose bees have been destroyed or treated for foul brood sell, or offer for sale, any bees, hives, or appurtenances of any kind after such destruction or treatment, and before being authorized by the inspector to do so, or should he expose, in his bee yard or elsewhere, any infected comb honey or other infected thing, or conceal the fact that such disease exists among his bees, such person shall be guilty of a misdemeanor, and upon conviction such person shall be fined not less than ten dollars nor more than twenty-five dollars.

SEC. 9. If any owner or keeper of bees knows of or after being notified by the bee inspector that foul brood or other infectious or contagious disease exists in any of the hives in the apiaries owned or in charge of said persons and shall fail to comply within ten days from receiving said knowledge and the date of receiving instructions from the county inspector to cure or destroy the bees or hives, or their appliances, such person shall be guilty of a misdemeanor, and upon conviction thereof such person shall be fined not less than ten dollars nor more than twenty-five dollars.

SEC. 10. When the owner or possessor of bees shall disobey the directions of said bee inspector in curing or destroying any diseased bees, honey, hives, or appliances shall become unlawful and a public nuisance, and the said bee inspector shall at once destroy said bees, honey, hives, or appliances, and may deputize such additional persons as he may find necessary to effect said destruction.

SEC. 11. The inspector shall make a monthly report in writing, under oath, to the board of county commissioners, in which report he shall state the days and number of hours in the preceding month spent by him in the actual discharge of his duties, and shall in said report state the name of the owner or keeper, and the location of the apiary upon which such time was spent in curing or destroying said bees, together with an itemized account, showing the dates and amounts for what incurred, money spent for any discharge of his duties, and to whom the same was paid, and for what services and considerations such indebtedness was incurred, and accompany said report with the affidavits given him under and in pursuance of section 3 of this act, and make full and complete report of all he did and results of his treatment of any apiary.

SEC. 12. After the inspector of bees in any county shall make report, as provided in the preceding section, said county commissioner shall allow to said inspector of bees two dollars for a full day, and one dollar for each half day, necessarily and actually employed in the discharge of his duties under this act, together with his necessary and actual expenses while so employed, to be audited, allowed, and paid by the county treasurer upon the warrant of the county auditor.

SEC. 12 a. There shall be levied annually on the owner of each colony of bees in each county in the State an annual tax of one (1) cent for each colony owned, which levy shall be placed on the tax duplicate of the county by the auditor of such county at the time of the levy of other taxes each year, and such levy shall be predicated upon the returns for taxation as made to such auditor by the assessors having jurisdiction in the premises for the return of personal property for taxation; such assessors shall be provided with blanks necessary to procure such returns from owners of colonies of bees, who shall on demand be required to list the same for taxation for the purposes of this act, as in other cases of listing and valuation of personality for taxation. The county treasurer shall collect the amount of said tax so assessed in the same manner and at the same time he collects other taxes, and the same shall be certified to him by the county auditor in the same manner as other taxes for collection. The amount so col-

lected shall constitute a special fund, to be disposed of in the payment of the salary and actual expenses of the inspector of bees appointed in pursuance of the provisions of the act of April 15, 1904, aforesaid.

Original act approved April 21st, 1904. Amended act approved March 17th, 1906.

TEXAS.

AN ACT to provide for the protection of honeybees against foul brood and other contagious diseases, and providing that all bee keepers report to the State entomologist when infectious diseases exist, providing for collecting the expense of eradicating the disease and fixing the charges upon the owner or agent of the bees, providing for the extermination of all contagious diseases, and providing penalties for the violation of any of the provisions of this act.

SECTION 1. *Be it enacted by the legislature of the State of Texas*, If any owner of or any person having control or possession of any honey bees in this State, knows that any bees so owned or controlled are affected with foul brood or any other contagious disease it shall be and is hereby made his duty to at once report said fact to the State entomologist, setting out in his said report all the facts known with reference to said infection. The State entomologist shall have full power in his discretion to order any owner or possessor of bees dwelling in hives without movable frames, or not permitting of ready examination, to transfer such bees to a movable frame hive within a specified time. In default of such transfer the State entomologist may destroy, or order destroyed, such hives, together with the honey, combs, frames, and bees contained therein, without recompense to the owner, lessee, or agent thereof.

SEC. 2. The State entomologist shall prescribe such rules and regulations as may in his judgment seem necessary for the eradication of all contagious diseases of bees, and if at any time the entomologist finds, or has reason to believe, that the owner or keeper of any bees, or the owner of any apiary, has refused or is refusing to comply with all or any such rules and regulations, then and in that event the State entomologist is hereby authorized to inspect said bees, and, if necessary, burn diseased colonies, appliances, and honey, and do any and all things necessary in the premises to eradicate foul brood or any other infectious disease of bees.

SEC. 3. When any owner or possessor of bees shall fail to carry out the instructions of the State entomologist as set forth in sections 1 and 2 of this act, the State entomologist or his assisant shall carry out such destruction or treatment, and shall present to the owner of said bees a bill for the actual cost of such destruction or treatment. In the failure of the owner or possessor of such bees to pay said bill within thirty days after the delivery of same to himself, tenant, or agent, or within thirty days after mailing same to his usual post-office address, the State entomologist shall certify to the county attorney of the county wherein such bees are located the amount and items of such bill, and the county attorney shall file suit for the recovery of said account. All moneys recovered by the county attorney for such destruction or treatment shall be paid into the hands of the county treasurer, to become a part of the fund for carrying out the provisions of this act.

SEC. 4. If any owner or keeper of any diseased colonies of bees shall barter or give away any infected bees, honey, or appliances, or shall expose any other bees to the danger of infection of the disease, or shall refuse or neglect to make report as provided in section 1 of this act, he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not exceeding two hundred dollars.

SEC. 5. The fact that the season when young colonies of bees will have the mother colonies is near at hand, and that there is no existing law properly governing colonies affected with foul brood creates an emergency, and an imperative public necessity requiring the suspension of the constitutional rule requiring bills to be read on three several days, and the same is so suspended, and this act shall take effect and be in force from and after its passage; and it is so enacted.

Became a law April 21, 1903.

UTAH.

LAW OF UTAH FOR THE PROTECTION AND ENCOURAGEMENT OF THE BEE INDUSTRY.

SECTION 1. The board of county commissioners of the several counties shall, when petitioned by a majority of the bee keepers thereof, appoint one or more qualified persons inspectors of bees for their respective counties.

SEC. 2. Such inspectors shall hold their office for two years and until their successors are appointed and qualified. They shall qualify by taking and subscribing their official oath and by giving bonds to be approved by their respective boards of county commissioners, which oath and bonds shall be filed with the county clerk.

SEC. 3. Inspectors shall be paid out of the county treasury for services actually rendered at such rate per day as the board of county commissioners may fix. The assessor of each county is hereby required to assess each colony of bees in his county in the same manner as other assessments are made. All taxes shall be assessed and collected thereon in the manner provided by law for the collection and payment of county taxes.

SEC. 4. All hives of bees in each county shall be carefully inspected at least once each year by a county or district inspector, where such inspector has been appointed, and, at any time upon complaint that disease exists among bees of any person, the inspector to whom complaint is made shall immediately inspect the bees said to be infected. The inspector shall have authority to take charge and control of diseased bees and their hives, and the tools and implements used in connection therewith for treatment, or destroy such bees, broods, or hives and their contents, or implements, as may be infected: *Provided*, That any owner questions a decision of the inspector he may appeal to three arbitrators selected from among the bee keepers of the county, one of whom shall be chosen by the owner, the second by the inspector, and the third so chosen, whose decision, concurred in by at least two of their number, shall be conclusive as to the condition of the bees at the time of such examination.

SEC. 5. Any person who shall hinder or obstruct, or attempt to hinder or obstruct, a duly appointed inspector from the performance of any duty required by this title, shall, on conviction thereof before a justice of peace having jurisdiction, be deemed guilty of a misdemeanor, and shall be fined for the first offense not less than five nor more than twenty-five dollars, and for any additional offenses any sum not exceeding fifty dollars.

Approved March 11th, 1897. To take effect January 1, 1898.

WASHINGTON.

Be it enacted by the legislature of the State of Washington:

SECTION 1. Whenever a petition is presented to the board of county commissioners of any county signed by ten or more persons, each of whom is a property

holder resident of the county and possessor of an apiary or place where bees are kept, stating that certain or all apiaries within the county are infected with the disease known as "foul brood," or any other disease which is infectious or contagious in its nature and injurious to bees, their eggs, or larvæ, and praying that an inspector be appointed by them, whose duty it shall be to supervise the treatment of said bees and apiaries as herein provided, the board of county commissioners shall, within twenty days thereafter, appoint a suitable person, who shall be a skilled bee keeper, inspector of apiaries. The said board of county commissioners may remove said inspector at any time for cause.

SEC. 2. It shall be the duty of the inspector in each county to cause an inspection to be made when he deems it necessary of any or every apiary, or other place within his jurisdiction in which bees are kept, and if found infected with foul brood or any other infectious or contagious disease injurious to the bees or their eggs or larvæ he shall notify the owner or owners, person or persons in charge or in possession of said apiaries or places where bees are kept that the same are infected with foul brood or any other disease infectious or contagious in nature and injurious to bees, their eggs, or larvæ, and he shall require such person or persons to eradicate and remove such disease or cause of contagion within a certain time, to be specified. Said notice may be served upon the person or persons, or either of them, owning or having charge or having possession of such infected apiaries or places where bees are kept by any inspector or by any person deputized by the said inspector for that purpose, or they may be served in the same manner as a summons in a civil action. Any and all such apiaries or places where bees are kept found infected with foul brood or any other infectious or contagious disease are hereby adjudged and declared to be a public nuisance, and whenever any such nuisance shall exist at any place within his jurisdiction or on the property of any nonresident or on any property the owner or owners of which can not be found by the inspector, after diligent search, within the county, or upon the property of any owner or owners upon whom notice aforesaid has been served, and who shall refuse or neglect to abate the same within the time specified, it shall be the duty of the inspector to abate the same, either by treating the disease, or by destroying the infected hives, together with their combs and bees therein. The expense thereof shall be a county charge, and the board of county commissioners shall allow and pay the same out of the general fund of the county.

SEC. 3. It shall be the duty of the county inspector of apiaries to keep a record of his official acts and doings and make report thereof to the board of county commissioners when required by said board.

SEC. 4. The salary of the county inspector of apiaries shall be three dollars per day when actually engaged in the performance of his duties: *Provided*, That the expenditures under this act in any county shall not exceed the sum of one hundred dollars per annum.

SEC. 5. The inspector of apiaries may, in his discretion, order the owner or owners or other person in charge of bees kept in box or other immovable or stationary comb hives in apiaries infected with foul brood or other infectious or contagious disease or within a radius of three miles of such diseased apiaries to transfer such bees to movable frame hives within a reasonable time, to be specified in such order or notice, and in default of such transfer the owner or owners or other person in charge of such bees, the inspector may destroy or cause to be destroyed all such hives together with their contents, and the expense thereof shall be a county charge, as provided in section 2 of this act.

SEC. 6. It shall be unlawful for any person owning or controlling bees within this State which are known to be infected with foul brood or other infectious

or contagious disease to remove said bees to a new location without first giving ten days' notice to the county inspector of apiaries, stating when and where he intends moving said bees. Any person violating the provisions of this section shall be deemed guilty of a misdemeanor.

SEC. 7. Any person or persons whose apiary is infected with foul brood or other infectious or contagious disease and who sells or offers for sale from such infected apiary any bees, hives, bee fixtures, or appurtenances, or who shall expose in his bee yard or elsewhere any infected comb honey, beeswax, or other infected thing, or who conceals the fact that his apiary is so infected shall be deemed guilty of a misdemeanor.

SEC. 8. Any person or persons who shall resist, impede, or hinder in any way the inspector of apiaries in the discharge of his duties under the provisions of this act shall be deemed guilty of a misdemeanor.

SEC. 9. An emergency exists, and this act shall take effect immediately.

WISCONSIN.

WISCONSIN STATUTES, 1903, VOLUME 1, CHAPTER 188.

SECTION 1494, f. *Inspection of apiaries—Inspection, appointment, duties, compensation.* The governor may appoint for a term of two years a State inspector of apiaries. Said inspector shall, when notified of existence of disease known as foul brood among apiaries, examine all such as are so reported and all others in the same locality and ascertain whether or not such disease exists, and, if satisfied of its existence, shall give the owner or person who has care of such apiaries full instructions as to the manner of treating them.

Within a reasonable time after making such examination the inspector shall make another examination thereof, and if the condition of any of them is such as in his judgment renders it necessary he may burn all the colonies of bees and all the comb necessary to prevent the spread of the disease.

Such inspector shall, before such burning, give the notice provided for in and otherwise proceed pursuant to the provisions of section 1492, b. The inspector shall make at the close of each calendar year a report to the governor, stating the number of apiaries visited, the number of those diseased and treated, the number of colonies of bees destroyed, and of the expenses incurred in the performance of his duties. Said inspector shall receive four dollars for each day actually and necessarily spent in the performance of his duties and be reimbursed the money expended by him in defraying expenses: *Provided*, That the total expenditure for such purpose shall not exceed seven hundred dollars per year.

Approved May 11, 1903.

WISCONSIN STATUTES, 1903, VOLUME 2, CHAPTER 187.

SECTION 4605, a. *Sale of a diseased apiary, etc.* Any owner of a diseased apiary, of honey made or taken from such an apiary, or appliances taken from such an apiary, who shall sell, barter, or give away any such apiary, honey, or appliances, or bees from such an apiary, expose other bees to the danger of contracting such disease, or refuse to allow the inspector of apiaries to inspect such apiary, honey, or appliances shall be fined not less than fifty dollars nor more than one hundred dollars, or be imprisoned in the county jail not less than one month nor more than two months. (Section 4, chapter 150, 1897.)

REPORTS OF THE PRELIMINARY AND ANNUAL MEETINGS OF THE AMERICAN ASSOCIATION OF HORTICULTURAL INSPECT- ORS, 1897-1905.

PRELIMINARY MEETINGS IN CHICAGO.

In a circular letter prepared at the office of the Illinois State entomologist, dated January 7, 1897, announcement was made of the discovery of the San Jose scale at fifteen different points in Illinois, and the opinion was expressed that it was likely that other States would be found similarly infested if a system of search and inspection similar to that of Illinois were instituted. It was further said that—

“The situation is so grave in Illinois that our State Horticultural Society has taken the subject up with great energy, and has prepared a bill for introduction to the State legislature, which has just begun its session, proposing measures of prevention and defense not only against the San Jose scale, but against insect and fungous pests in general destructive to horticultural products. * * * There is a strong probability that this bill, or some substitute for it, will be passed by our legislature, probably with an emergency clause. Would it not be practicable and desirable for those of us who are officially interested and most responsible in the premises to meet at an early day for conference and for a comparison of ideas and plans with reference to this matter? I am sure that we should, in this State, be very glad indeed to have the benefit of the judgment of those similarly situated.

“I am sending this letter to Indiana, Ohio, Michigan, Minnesota, Wisconsin, Iowa, and Missouri. Would you be willing to meet representatives from any two or more of these States, either at Champaign or Chicago, as might be most convenient for those proposing to confer? An early reply will be appreciated.

“Sincerely, yours,

“S. A. FORBES.”

This letter was addressed to Prof. E. S. Goff, Madison, Wis.; Prof. Otto Luger, St. Anthony Park, Minn.; Prof. Herbert Osborn, Ames, Iowa; Prof. J. M. Stedman, Columbia, Mo.; Prof. L. R. Taft, Agricultural College, Mich.; Prof. James Troop, Lafayette, Ind., and Prof. F. M. Webster, Wooster, Ohio.

Sequent to this correspondence a meeting was called for Chicago, January 29, 1897.

At this conference, according to a circular report issued from the Illinois State entomologist's office, February 15, 1897, the following eight North-Central States were represented, either by their official entomologists or by their experiment station horticulturists, namely, Ohio, Indiana, Illinois, Missouri, Iowa, Michigan, Wisconsin, and Minnesota. Measures were discussed to be taken by the separate States “for the inspection of orchards, nursery stock, and the like, and especially for the detection and destruction of the San Jose scale wherever there is reason to suppose that it may have been introduced. It was the common judgment of this conference that both State and national legislation looking to these ends has become imperative.”

The following resolutions were adopted at this meeting:

"Resolved, That we recommend to the people of our respective States that, in purchasing stock from other than home nurseries, they require a certificate of inspection from such nursery specifying that such stock has been inspected by an official inspector or has been grown on grounds duly inspected, and specifying the result of such inspection.

"Resolved, That we indorse the call of the Ohio State Horticultural Society for a national convention to consider and recommend the most appropriate Federal and State legislation for preventing the introduction and spread of noxious insects and fungi in the United States."

April 3, 1899, the following circular letter was issued to the proper officers in the States of Michigan, Kentucky, Missouri, Ohio, Indiana, and Iowa:

"The recent passage by the State legislatures of Indiana and Illinois of laws requiring inspection of nursery stock with reference to injurious insects and fungous diseases leads me to suggest the desirability of a conference among inspectors of a number of adjacent States with a view to establishing common methods, discussing objects of inspection, forms of certificates, and other matters of common interest on which it would be well to have an exact understanding. * * * I think we could probably bring about a meeting in Chicago of representatives of these States, since a similar meeting held two years ago seems to have had a good deal of influence in securing common and intelligent action leading to the establishment of inspection laws in these States.

"Very truly yours,

"S. A. FORBES."

Replies being generally favorable, a meeting was called to be held in Chicago April 29. At this conference the States of Wisconsin, Iowa, Indiana, Ohio, and Illinois were represented by their State entomologists or others charged with the duty of horticultural inspection. The following general conclusions were unanimously agreed upon:

"An inspector's certificate to nurserymen must usually be based upon a general inspection of trees still standing in the nursery rows, and this fact should be shown in the certificate. Where injurious insects or fungous disease are found sufficient to make a certificate inadmissible, but are capable of being suppressed by fumigation or other procedure, the certificate should be withheld until such steps have been taken as to satisfy the inspector that no further danger exists. For example, if dangerous insects are found upon the *roots* of nursery stock, no certificate should be issued until the plants have been fumigated. If adjacent grounds are infested with dangerous insects or plant disease so near the nursery premises as to make them especially subject to invasion from without, fumigation of all specially exposed nursery stock should be required as a condition of the issuance of a certificate, even though the premises themselves may not be found infested at the time of inspection. The word 'dangerous' used in connection with insects and plant diseases is understood to mean, in this connection, dangerous to the property of customers—likely to be transported with nursery stock to the injury of customers.

"It should be the policy of departments of inspection to encourage and stimulate the thorough practice of fumigation as a substitute for inspection whenever practicable, with a view to hastening the time when a general requirement may be established for the fumigation of all nursery stock before sale and delivery.

"Inspections should be made between August 1 and November 1, and certificates should expire the first of the following June. If nurserymen desire to

make shipments between June 1 and August 1, arrangements must be made by them for special inspections during this period.

"The following was adopted as the general form of the certificate:

"This is to certify that the nursery premises and growing stock of ———, situated in ———, have been inspected according to the provisions of the law [here insert title of act under which inspections are made], and no indications have been found of the presence of the San Jose scale or other dangerous [or dangerously injurious] insects or plant disease. This certificate is invalid after June 1, 189—.

"Date, ———.

"Each inspector should prepare a list of official inspectors of other States and Territories whose certificates will be accepted by him as valid, and this list should be sent by each inspector to all nurserymen within his own State whose premises have been inspected and certified, with information that they will be at liberty to attach the certificate of their own State inspector to all nursery stock received by them bearing the official certificate of any one of the inspectors on the above-mentioned list. This arrangement is supposed to relieve nurserymen from the impracticable requirement of sending with each lot of stock disposed of a copy of each original certificate which this stock may have borne. These lists of accredited inspectors may also be furnished to dealers in nursery stock who do not themselves own nursery premises, provided the State inspector is satisfied of their honesty and responsibility.

"The presence of the San Jose scale, of peach yellows, of rosette, and of the black-knot of the plum should be regarded in all cases as ground for withholding a certificate until premises have been completely freed from them. The presence of the woolly aphis, of the oyster-shell scale, of the scurfy scale, of anthracnose, and of other common and wide-spread injurious insects and diseases should not be regarded as a bar to a certificate unless they are exceptionally abundant, so as to affect the value of the stock and to render likely an unusual increase or more general introduction of these insects and diseases, provided such infested or infected nursery stock is sold and shipped.

"Inspections should include not only the nursery stock to be certified, but also stock left over from previous years, old trees, and the like, together with surrounding premises in general."

In response to numerous requests, steps were taken December 1, 1900, toward still another conference, in consequence especially of difficulties and inconsistencies in administration which had appeared, some of them threatening trouble between the responsible officers in different States. "For example, the law in one State requires that all inspections shall be finished not later than August 15, and the official inspector in another State has given general notice that any certificate dated earlier than August 15 will be disregarded in his State."

This call was made to include representatives of Kansas, Colorado, Tennessee, Wisconsin, Pennsylvania, New York, Nebraska, Michigan, Kentucky, and Iowa, and the meeting was held in Chicago January 4, 1901. The proceedings of this meeting were reported by circular letter distributed January 14, and were as follows:

"At a conference of horticultural inspectors of the States of New York, Michigan, Indiana, Illinois, Iowa, Kentucky, and Tennessee held at the Palmer House, Chicago, January 4, 1901, the general subject of the methods and objects of nursery inspection was broadly discussed, with special attention to certain details in which a comparison of views was thought to be particularly desirable.

"1. Difficulties having been made by certain State officials with respect to

the acceptance of inspection certificates from other States, this subject was discussed at length, and the opinion was unanimously expressed by the conference that State inspectors should accept the inspection certificates of other States issued by authorities legally constituted for that purpose, as *prima facie* evidence of the facts therein set forth. It was not intended by this statement to prevent or discourage a supplementary inspection of certified stock if, in the judgment of any inspector, special conditions might make this necessary.

"2. On comparison of the practice of different State inspectors, wide differences were found in the time during which nursery inspections are made, due principally to differences in local condition or business methods in different parts of the country. After full discussion it was decided that the period of inspection should be determined in each State at the discretion of the inspector; but it was agreed that all peach stock should be inspected as late in the season as practicable, particularly where the surroundings were such as to cause suspicion of the occurrence of the San Jose scale, or where the origin of the buds was either suspicious or unknown. In such cases, if the nursery was inspected early a late supplemental inspection of the peach stock should be made.

"3. With respect to a nursery some sections of the stock of which is so infested or infected as to make its sale objectionable, but not in a way to damage or endanger the remainder of the stock, the practice adopted in Illinois was approved and recommended to all inspectors. Under this practice a nurseryman, some of whose stock is infected, for example, with the crown-gall, the remainder of it being free, is given a certificate which reads as follows: 'This is to certify that the nursery stock which bears this certificate, grown upon the nursery premises of ———, situated ———, has been,' etc. This certificate is issued with the limitation, expressed in writing, that it is not applicable to any of the stock to which objection is made, and on the written promise of the nurseryman receiving it that it shall not be so applied.

"4. With respect to a form of certificate for dealers in nursery stock who do not own nursery premises, but wish a certificate from their own State inspector available for their shipments, the Iowa practice was approved, under which a dealer's certificate is issued as follows: 'This is to certify that the nursery stock for sale by ———, of ———, has been inspected,' etc. Previous to issuing such a certificate the Iowa inspector requires a statement from the dealer, certified before a notary, showing all persons from whom said dealer has purchased stock, and containing a promise that if stock is afterwards purchased from other persons than those on this certified list the inspector will be notified forthwith, and opportunity given him to inspect such stock before sale, if so desired.

"5. It appeared, upon a comparison of the laws and practices of different States, that ornamental trees, shrubs, and vines were generally included in the inspection, if grown for sale, and that strawberry plants were also inspected, if held for sale, in New York, Kentucky, Tennessee, Iowa, and Michigan, but not in Indiana and Illinois. In States having a considerable business in the sale of cuttings it was deemed necessary that vineyards from which such cuttings were sold should be inspected and certified as nurseries.

"6. It was generally agreed with respect to the woolly aphis that gradually increasing pressure should be brought to bear for the reduction of this insect in nurseries, but that no uniform practice could be established because of wide differences in its abundance in different States. The New York practice of requiring the rejection and destruction of trees sufficiently infested to show knots on the roots was commonly approved. It was also thought well to require insecticide treatment, with kerosene emulsion, of roots of nursery trees whitened by this insect. A similar policy of gradually increasing pressure of require-

ment was also recommended with respect to the scurfy scale, particularly in those States where it is not now generally and uniformly distributed. It was held at present to be unwise to require the destruction of trees exposed to infection with crown-gall, but not visibly so infected. Trees actually bearing this gall, either at the crown or on the roots, were regarded as unmerchantable.

"7. After full discussion it was voted unanimously to organize as a society of official horticultural inspectors, membership to be open to those officially connected with the work of horticultural inspection in the various States of the Union and in Canada. Prof. S. A. Forbes, of Illinois, was elected president for one year and until the next regular meeting thereafter. It was further voted that the first meeting of the new society should be held in connection with the annual convention of the Association of Colleges and Experiment Stations, to which time the society adjourned."

Following upon this last of the series of Chicago meetings, a call was issued October 28, 1901, for a more general meeting, as follows:

"At a meeting of official horticultural inspectors of several States, held in Chicago, January 4, 1901, a permanent organization was effected and steps were taken preliminary to a general conference of such inspectors for the United States and Canada, to be held in Washington in connection with the meeting of the American Association of Agricultural Colleges and Experiment Stations.

"The undersigned, as chairman of the Chicago conference, was directed to announce this meeting in due time and to act as an executive committee in making arrangements for it. A preliminary statement to the above effect was issued January 24, and I have now to add that a meeting of the Society of Official Horticultural Inspectors will be held at the Ebbitt House, in Washington, D. C., commencing at 7.30 p. m., Monday, November 11. All official inspectors of nurseries and other horticultural property and all other officers responsible for nursery and orchard inspection are eligible to membership in this society and are cordially invited to attend this conference.

"The meeting will be devoted to a discussion of matters of general interest relating to the inspection of nurseries and orchards and to the control of dangerous fungous and insect pests, including, of course, the San Jose scale. No formal programme will be prepared in advance, and any member of the conference should feel at liberty to propose for discussion any subject within these very general limits. Certain topics are, however, of such general and considerable importance that it will be well to come prepared to discuss them, and I take the liberty of suggesting, consequently, the following list as pertinent to the conference proposed:

"1. Within what limits of time may nurseries properly be inspected, and what period should the annual certificate be made to cover?

"2. What should be the usual form of the certificate?

"3. What should be the procedure, or form of certificate, in case some part of a nursery is affected by a dangerous fungous or insect pest not of a kind to involve other parts not so affected—if crown-gall, for example, occurs on certain peach stock, no other varieties of trees in the nursery being so diseased?

"4. What should be the common policy of State inspectors with reference to stock officially inspected and certified in other States?

"5. How wide an application should be given to the term 'nursery stock?' Should it include herbaceous plants grown out of doors? Should it ever cover greenhouse stock?

"6. What nursery pests should be regarded as dangerous enough to influence or prevent the granting of a certificate?

"7. May provision be made for the publication of a practical article on the

principal nursery pests of the country, available for all horticultural inspectors and distributed to all nurserymen and others immediately interested?

"8. What measures should be taken by horticultural inspectors for the regulation of the business of dealers not owners of nursery premises nor growing their own stock for sale?

"9. Is National legislation covering nursery inspection desirable and practicable?

"10. What, in the judgment of the conference, is the best insecticide programme for orchards infested with the San Jose scale—first, for the official entomologist charged with the destruction of the scale; second, for the private owner seeking to suppress the scale or to keep it in check?

"11. What insects or fungous pests of the orchard should be regarded as sufficiently dangerous to the property of others to require suppression by individuals in the general interest?

"12. What is a sound public policy with respect to the division between the State and the property owner of the costs of a practical operation for the control of horticultural pests?

"Those proposing to attend this conference are respectfully requested to send notice of such intention to the undersigned at Urbana, Ill., until November 8, and thereafter to the Ebbitt House, Washington. Special suggestions with regard to topics for discussion will also be very welcome.

"S. A. FORBES."

FIRST ANNUAL MEETING.

A general meeting of the American Association of Horticultural Inspectors for the United States and Canada was called to order at the Ebbitt House, Washington, D. C., November 11, 1901, at 7.30 p. m., by the chairman, Mr. S. A. Forbes, of Illinois. Mr. Fernald, of Massachusetts, was chosen secretary.

Those present during the sessions were:

Connecticut, W. E. Britton; Delaware, W. Webb; Georgia, W. M. Scott, W. Fiske; Illinois, S. A. Forbes; Indiana, J. Troop; Iowa, H. E. Summers; Maryland, A. L. Quaintance, J. B. S. Norton, Professor Blodgett; Massachusetts, H. T. Fernald; Missouri, J. M. Stedman; New Jersey, J. B. Smith; New York, G. A. Atwood; North Carolina, F. Sherman; Ohio, F. M. Webster; Pennsylvania, J. Hamilton, E. B. Engle; Virginia, W. B. Alwood, J. L. Phillips; Wisconsin, W. A. Henry. W. G. Johnson and E. D. Sanderson were also present at a part of the meetings as visitors.

On the motion of Mr. Alwood, of Virginia, it was voted that a committee of three be appointed by the chair to report as soon as possible on the advisability of forming a permanent organization. The president appointed Messrs. Smith, Webster, and Summers.

On the motion of Mr. Smith, of New Jersey, the question, "Within what limits of time may nurseries properly be inspected, and what period should the annual certificate be made to cover?" was taken up. After much discussion it was voted, on the motion of Mr. Smith, of New Jersey, that the resolution adopted by the meeting of horticultural inspectors in Chicago on January 4, 1901, bearing on this point be adopted by the society, as follows: That the period of inspection should be determined in each State at the discretion of the inspector, but it was agreed that all peach stock should be inspected as late in the season as practicable, particularly where the surroundings were such as to cause suspicion of the occurrence of the San Jose scale, or where the origin of the buds was either suspicious or unknown. In such cases, if the nursery was

inspected early, a late supplemental inspection of the peach stock should be made.

On the motion of Mr. Alwood, of Virginia, it was voted to be the sense of this conference that a certificate ought not to extend beyond the commencement of the breeding period of the San Jose scale. On the motion of Mr. Webster, of Ohio, the question was taken up and discussed and was still under consideration when the meeting adjourned till November 12 at 9 a. m.

November 12—9 a. m. The meeting was called to order by the chairman. The reading of the minutes was omitted. Mr. Hamilton, of Pennsylvania, offered the following resolution, which was adopted:

Resolved, That in order to arrive at a common understanding as to the best insecticides to use for the destruction of the San Jose scale in the orchards and nurseries of this country, and in order to secure definite directions for their application, a committee consisting of Messrs. Smith, of New Jersey; Webster, of Ohio; Fernald, of Massachusetts; Alwood, of Virginia, and Atwood, of New York, is hereby appointed to prepare a recommendation to be submitted to this association for its consideration."

On the motion of Mr. Fernald, of Massachusetts, the question, "What nursery pests should be regarded as dangerous enough to influence or prevent the granting of a certificate?" was taken up. After considerable discussion it was voted, on the motion of Mr. Alwood, of Virginia, "that each official inspector submit a list of those insects and diseases which he thinks should always bar nursery stock from receiving an official certificate and a secondary list of insects and diseases of less importance, with terse statements of how he deals with them."

It was voted, on the motion of Mr. Alwood, of Virginia, that when this meeting adjourns it adjourn to meet in joint session with the entomological section of the general association at 2 o'clock this afternoon and that a further session be held at 7 p. m.

The question of the legal right of inspectors to enter private property and enforce treatment against the wishes of the owners was then discussed.

The tendency of the discussion—participated in by Messrs. Atwood, of New York; Smith, of New Jersey; Alwood, of Virginia, and Hamilton, of Pennsylvania—was to the conclusion that in those States at least it would be illegal to force entry and destroy property without due process of law; any law giving such power to any individual would be unconstitutional. The topic "What should be the common policy of State inspectors with reference to stock officially inspected and certified in other States?" was taken up and was under discussion when the association adjourned.

November 12—7.15 p. m. Meeting called to order by the chairman. Committee on advisability of permanent organization reported a recommendation that a permanent organization be not formed, but that another meeting be held in connection with the next meeting of the American Association of Agricultural Colleges and Experiment Stations, and this report was adopted.

On the motion of Mr. Summers, of Iowa, it was voted that when this meeting adjourns it adjourn till 9 a. m. November 13, and that the first order of business be the selection of a chairman for the next year. The report of the committee on the resolution offered by Mr. Hamilton, of Pennsylvania, was made as follows:

"The committee, after due consideration, finds itself able to agree upon the following recommendations for treatment:

"1. For nurseries: Proper fumigation with hydrocyanic-acid gas after inspection.

"2. For orchards: Late summer and fall treatment with dilute solutions of insecticide soaps, oils, or other effective insecticides to kill young scales; winter treatment with insecticide soaps or oils sufficiently strong to kill the scale and which have been proved safe to trees of all kinds in the region where the application is to be made."

The report of the committee was adopted.

Further discussion of the fourth topic (common policy of State inspectors) was laid upon the table till the next session.

On the motion of Mr. Smith, of New Jersey, the topic "What should be the procedure, or form of certificate, in case some part of a nursery is affected by a dangerous fungus or insect pest not of a kind to involve other parts not so affected?" was taken up for consideration. It was voted, on the motion of Mr. Summers, of Iowa, that it is the sense of this body that but one form of certificate be used as a rule, so worded as to be applicable to stock sold from nurseries after some portions have been thrown out as not included in the certificate. The topic "What should be the usual form of the certificate?" was then considered at length. On the motion of Mr. Smith, of New Jersey, it was voted that it is the sense of this meeting that every certificate should specify the date of the completion of the inspection. On the motion of Mr. Summers, it was voted that it is the sense of this meeting that the certificate should be worded in the impersonal form. On the motion of Mr. Smith, of New Jersey, it was voted as the sense of the meeting that no insect or fungus should be specifically named in the certificate, but that that portion should read "free from dangerously injurious insects and diseases," etc.

The secretary stated that he would prepare and send copies of the record of these meetings to all of those present who desired to receive them.

The meeting then adjourned.

November 13.—9 a. m. The meeting was called to order by the chairman. The minutes of the previous meeting were read, corrected, and approved.

On the motion of Mr. Summers, of Iowa, Dr. S. A. Forbes, of Illinois, was unanimously chosen as chairman of this body for the next meeting, to be held in the fall of 1902.

The topic, "Is national legislation covering nursery inspection desirable and practicable?" was then discussed. On the motion of Mr. Alwood, of Virginia, it was—

"Resolved, That it is the sense of this body that the bill providing for national control of interstate commerce in nursery stock which has been frequently indorsed by entomologists, nurserymen, and orchardists and favorably reported in both branches of Congress, should be enacted into a law."

"May provision be made for the publication of a practical article on the principal nursery pests of the country, available for all horticultural inspectors and distributed to all nurserymen and others immediately interested?" was next taken up. It was voted, on the motion of Mr. Smith, of New Jersey, that the United States Department of Agriculture be asked to publish such a document.

The topic, "How wide an application should be given to the term 'nursery stock;' should it include herbaceous plants grown out of doors; should it ever cover greenhouse stock?" was next considered. On the motion of Mr. Summers, of Iowa, it was voted that it is the sense of this body that strawberry plants should be regarded as nursery stock and included. It was also voted that grape cuttings be included as a part of stock necessary to inspect.

On the motion of Mr. Scott, of Georgia, it was voted that general ornamental stock grown out of doors be included in all inspections. The topic, "What measures should be taken by horticultural inspectors for the regulation of the busi-

ness of dealers, not owners of nursery premises nor growing their own stock for sale?" was then discussed and the present practice in a number of States was explained, but no action was taken on the matter.

It was voted, on the motion of Mr. Scott, of Georgia, that when the meeting adjourns it adjourns to meet not as horticultural inspectors, but with the entomological division of the American Association of Agricultural Colleges and Experiment Stations.

The topic, "What is a sound public policy with respect to the division between the State and the property owner of the costs of a practical operation for the control of horticultural pests?" was then discussed. On the motion of Mr. Scott, of Georgia, it was voted that it is the sense of this body that in all cases when the State makes any provision for the inspection of nurseries these inspections should be conducted absolutely without cost to the nurserymen.

The meeting then adjourned.

SECOND ANNUAL MEETING.

The opening session was called to order in the Kimball House, October 6, 1902, at 7.30 p. m., by the chairman, Mr. S. A. Forbes, of Illinois. Mr. Scott, of Georgia, was chosen secretary for the Atlanta meeting.

The following inspectors and entomologists were present at the meeting:

Florida, H. A. Gossard; Georgia, W. M. Scott, W. F. Fiske, and J. C. Bridwell; Illinois, S. A. Forbes; Massachusetts, H. T. Fernald; New Jersey, John B. Smith; New York, M. V. Slingerland and V. H. Lowe; Ohio, A. F. Burgess; Pennsylvania, John Hamilton, George C. Butz, and E. B. Engle; South Carolina, Charles E. Chambliss; Virginia, J. L. Phillips.

On motion of Mr. Gossard, it was voted to take up the topics suggested by the chairman in the order given.

The chairman suggested the advisability of a committee to formulate conclusions from the discussions, whereupon Mr. Smith suggested that the secretary or a member could perform this office by offering a resolution at the conclusion of the discussions upon each topic. The latter plan was adopted.

On motion of Mr. Smith it was voted to have a morning session the following day (October 7) as horticultural inspectors and in the afternoon of that day to meet as entomologists with the section on entomology, American Association of Agricultural Colleges and Experiment Stations, under the officers of that body.

The first topic on the list—"Interstate comity with respect to the certification of nurseries"—was then taken up. The discussion of this topic was participated in by Messrs. Forbes, Smith, Burgess, Hamilton, Gossard, Fernald, Phillips, and Scott. The tendency of the discussion is expressed in the following resolution by Mr. Smith, which was adopted without a dissenting vote:

"*Resolved*, That the examining or certifying officer of each State accept at its face value the statements made in certificates duly granted under the laws of other States, so far as the laws of his own State admit, unless information at hand creates a reasonable doubt as to the regularity of the certificate or its application."

Topic 2—"Exchange of communications with reference to receipt of diseased nursery stock originating in other States." The discussion of this topic was brief, as all present appeared to be of the same mind, viz:

"That the inspectors of the several States should freely and frankly exchange

communications with regard to nursery infestation, and that each should notify every other of such cases of infestation and attempts at evasion of the laws as might from time to time come to his notice."—Resolution by the secretary unanimously adopted. The session then adjourned until morning.

October 7—9 a. m.—The meeting was called to order by the chairman, and the third topic was discussed.

Topic 3—"Interstate cooperation for the control of horticultural pests whose area of distribution extends across State lines." In the discussion of this topic several cases were cited in which it was shown that cooperation was necessary to produce the desired results. This question was disposed of by the adoption of the following resolution offered by Mr. Fernald:

"*Resolved*, That interstate cooperation for the control of horticultural pests whose area of distribution extends across State lines is most desirable and should be as complete as the laws of the States concerned will permit, and that in the treatment of any particular pest preference should be given to such cases."

Topic 4—"Is it desirable that nurserymen should pay any part, or all, of the expenses of nursery inspection required by law, either directly or as a fee for a certificate?" Mr. Smith and others thought that nurserymen should not pay a fee for or bear the expense of the ordinary inspection, but in cases where extra inspections were made for the special benefit of the owner he should pay the expense thereof. Mr. Fernald agreed, but thought that the nurserymen should be required to take out a license at a small fee as a matter of record in the office of the inspector. Mr. Butz thought it advisable to charge a small fee for tree to tree examinations in cases of infestation, if the owner of the infested nursery desired it. Mr. Smith's plan was to advise the owner to clean up his nursery before the inspection is made. Mr. Hamilton thought that in justice to the nurserymen no charge should be made for the inspection. Mr. Burgess thought it inconsistent to make free inspections of nursery stock and charge fees for the inspection of other commodities, such as oil and fertilizers.

The discussion was concluded by the adoption of the following resolution of Mr. Smith:

"*Resolved*, That it is the sense of this body that the nurserymen should not be required to pay the expense of the ordinary inspection of nursery stock."

Topic 5—"Is it desirable that the entire cost of insecticide or fungicide measures required by law should be borne by the owner of the affected property?" In the discussion of this topic the consensus of opinion was that the State should not bear the cost of the treatment of private premises, and the following resolution by the secretary was adopted:

"*Resolved*, That the entire cost of insecticide or fungicide measures required by law should be borne by the owner of the affected property."

Topic 6 was passed over for later consideration.

Topic 7—"Lists, reported by members, of nursery pests in their States whose continued presence will prevent the certification of a nursery." Mr. Smith's practice in New Jersey was to withhold certificate from nurserymen whose premises were found infested with San Jose scale, at least until all infestation was eliminated. Stock actually infested with black knot was not certified. Yellows could not be detected on nursery stock and was hardly considered as a factor in the inspection. Crown gall was inspected for, so far as possible, after the stock was dug and visibly diseased plants discarded. Woolly aphid—badly infested stock was destroyed. The occurrence of *Aspidiotus ancylus*, *A. forbesi*, and *Chionaspis furfurus* would not bar the stock. The occurrence of any scale insect on imported stock would prevent certification, and the presence of *Diaspis pyricola* especially would act as a bar.

The session then adjourned to meet as entomologists with the Entomological Section of the American Association of Agricultural Colleges and Experiment Stations at 2 p. m.

October 7—8 p. m. The meeting was again called to order by the chairman and the discussion of topic 7 continued.

Mr. Fernald reported that in Massachusetts no certificate would be granted so long as the San Jose scale, *Diaspis pentagona*, *Aspidiotus*, *ostreaformis*, gypsy moth, brown-tail moth, yellows, rosette, or black knot is found infesting the stock. Crown gall, he stated, had not so far been found in Massachusetts.

Mr. Gossard reported that it was his practice in Florida to withhold certificate from the owner of premises infested with San Jose scale until the proper steps had been taken to get rid of the pest by fumigation or otherwise. *Diaspis pentagona* occurred in the State, but so far had not been found in the nurseries. Citrus plants are commonly infested with various scale insects, but no definite action had yet been taken with respect to such cases. White fly was generally distributed as to render restrictive measures against it impracticable, but treatment was recommended.

In case of crown gall the owners were instructed to destroy all affected plants, and root-knot infestation was also rejected.

Mr. Hamilton stated that the prevailing rule in Pennsylvania was to grant a certificate when the nursery was found apparently free from San Jose scale, and to withhold the same when this pest was found. Mr. Butz, of the same State, explained further that in cases of crown gall, woolly aphis, and some other of the more injurious pests the nurserymen were requested to discard badly affected stock.

Mr. Burgess reported that in Ohio the presence in a nursery of the San Jose scale, black knot, or peach yellows was sufficient ground for withholding certificate, and that plants infested with woolly aphis or affected with crown gall were caused to be destroyed. He stated that the oyster-shell scale was doing considerable damage in Ohio, and so far as practicable its dissemination on nursery stock was prevented.

Mr. Phillips reported that the practice in Virginia was to withhold certificate from nurseries in which San Jose scale, black knot, or peach yellows was found until the trouble was effectually eliminated. Peach yellows had not so far been found in the nurseries, but diseased orchard trees in the neighborhood of a nursery were caused to be destroyed before a certificate was granted. The same was true of black knot. He stated further that severe cases of crown gall, woolly aphis, and pear blight were not admitted under certificate. Plants actually showing the presence of such pests were rejected.

Mr. Forbes required the Illinois inspectors to send in a statement of every pest found in the nursery, and before a certificate was granted he required the elimination of the San Jose scale and black knot. Precautions were taken to avoid sending out borers, woolly aphis, crown gall, and pear blight. Plants infested with woolly aphis to the extent of causing warty formations on the roots were discarded, and so also were plants visibly affected with crown gall. Crown gall was common on apple in Illinois, but was not found on peach. Noticeable infestation of the scurfy scale and bad cases of oyster-shell scale were rejected.

Mr. Engle, of Pennsylvania, suggested that in these discussions one important insect—the black peach aphis—had been overlooked, and that, in his opinion, all inspectors should rule against this pest.

Mr. Scott stated that in Georgia the presence of the San Jose scale, *Diaspis pentagona*, black knot, or rosette would prevent the certification of a nursery:

that stock seriously affected with crown gall, root knot, or woolly aphis was not allowed to be sent out under certificate, and that stock infested with the cherry scale, scurfy scale, or oyster-shell scale was caused to be properly treated before it was sent out. It had been his practice in suspicious cases to have the stock inspected on the heeling grounds for crown gall, woolly aphis, and scale insects.

Referring to the statement by Mr. Forbes that in Illinois crown gall was found only on apple, Mr. Phillips stated that the same was true in Virginia. Mr. Scott stated that in Georgia this disease was equally common on peach and apple, while Mr. Smith's observation was that in New Jersey it was confined entirely to the peach, and Mr. Gossard stated that the same was true for Florida.

The discussion of this topic being concluded, Mr. Smith moved that the chairman appoint a committee of three, including himself, to whom shall be intrusted the duty of comparing all existing laws concerning insect control in nursery or orchard, who shall suggest points to be covered in State legislation, and who shall formulate suggestively uniform State and Federal legislation to regulate nursery inspection, interstate traffic, and orchard control. Report to be made at the next meeting of this body.

At the suggestion of Mr. Fernald the motion was so amended as to couple the word "disease" with that of "insect." The motion was then adopted as amended.

Topic 9.—"A statement by each member of the procedure taken in his State in cases of nursery infestation with scale or other dangerous pests." Mr. Scott stated that the Georgia law prohibited the certification of a nursery when any portion of it was found infested with San Jose scale or like pests, and that he had disposed of such cases according to the individuality of the nurseryman as well as the circumstances attending the case, in the following manner:

Case 1.—A portion of a large nursery was found infested with San Jose scale, and, as agreed to by the owner, its customers were notified of the exact conditions, with assurance that the stock actually infested would be burned and the remainder fumigated under supervision. To the surprise of both the owner and himself not a single order was countermanded, and practically the entire stock was disposed of at the customary prices.

Case 2.—Upon the inspection of a certain nursery a single specimen of San Jose scale was found upon a plum leaf, and in spite of a most careful examination no further infestation could be found at that time. A second inspection at the heeling grounds revealed a slight infestation of a dozen or more trees, which were thrown out. The owner would not agree to the notification of his customers as in case 1, and a certificate to cover the contents of each box was issued after a list to whom the stock was intended to be shipped was furnished. Other cases were treated similarly.

Case 3.—In this case the nursery was located in a section where practically all the orchards were infested, and the fruit interest was sufficiently great to demand all the stock grown in this nursery. The certificate issued set forth the facts, viz. that San Jose scale was found in a portion of the nursery and that the proper steps had been taken to eliminate it. Under this certificate all the stock (except apples, which they made no attempt to sell) was disposed of at market prices.

In Pennsylvania Mr. Hamilton required under affidavit the attachment of a statement of fumigation to each shipment.

In Florida Mr. Gossard requires a thorough cleaning up by destruction of trees actually infested and the fumigation of the remainder.

In Illinois Mr. Forbes did not require the fumigation of the entire stock when scale was found in an isolated portion of the nursery unless the indications were that there had been a general spread of the scale. However, fumigation was required for the infested portions or for the entire stock when the infestation was general.

In New Jersey Mr. Smith required the fumigation of the entire stock when scale was found in the nursery, but under no circumstances did he allow shipments of stock from infested nurseries to go outside the State. However, he did not restrict the sale of such stock within the State.

In Ohio Mr. Burgess destroyed all infested stock and requires the fumigation of such as is dangerously near.

In Massachusetts Mr. Fernald gave the owner the option of fumigating or destroying the infested stock and in cases of general infestation a fumigation affidavit was required.

Mr. Fernald then offered the following resolution:

“Resolved, That in the opinion of this meeting nursery stock fumigated according to accepted requirements should be considered as satisfactory as stock sold under certificates of inspection only.”

Mr. Phillips thought that the adoption of this resolution might give fumigation a stronger indorsement than it deserved unless it was intended that inspection should always be coupled with it. He related an instance in which a bundle of infested stock was placed at the back end of a fumigating house opposite the point where the gas was generated. The house was then filled and charged, with the result that the scales came through unharmed. Mr. Scott wished to know if the resolution carried the meaning that fumigation should take the place of inspection. Mr. Hamilton and Mr. Fernald explained that the resolution was not to be so construed. After very little further discussion the resolution was adopted without a dissenting vote, and the session then adjourned to reassemble immediately after the adjournment of the section on entomology of the American Association of Agricultural Colleges and Experiment Stations on the 8th.

October 8—12 m. After calling the meeting to order the chairman asked if it were desirable to continue the organization, whereupon Mr. Smith stated that in his opinion no organization of entomologists was accomplishing so much as this one and that the work had only begun. He moved that the association meet next year at the same time and place as the American Association of Agricultural Colleges and Experiment Stations. The motion was carried and Mr. Fernald nominated Mr. Forbes chairman for next year. Mr. Forbes was unanimously reelected. He accepted on condition that a vice-chairman be elected, so that in case of his enforced absence from the meeting the chair would be filled. Mr. Smith was put in nomination and elected vice-chairman.

The chairman then read a letter from Mr. Atwood, of New York, giving a statement of the practices in that State with reference to the topics under discussion at this meeting.

Topic 8—“Statements by members of their recent experience and observations with respect to the relative practical values of insecticides for the San Jose scale.” This topic was treated by Mr. Smith in a paper before the section on entomology, the discussion of which was continued by the horticultural inspectors after the adjournment of that section.

Mr. Fernald then reported upon some experiments which he recently made in Massachusetts and which represented the most extensive work against the San Jose scale ever done in New England. The discussions were participated in by nearly every one present, were quite lengthy, and tended to show that the

petroleum oils, whale-oil soap, and lime-salt-sulphur wash constituted the standard remedies for the San Jose scale in orchards.

The meeting then adjourned.

THIRD ANNUAL MEETING.

The association met at 9 a. m., Tuesday, November 17, 1903, at the Shoreham. In the absence of the chairman, Prof. S. A. Forbes, the body was called to order by the vice-chairman, Dr. J. B. Smith, of New Jersey. J. B. S. Norton, of Maryland, was elected secretary.

The following inspectors and entomologists were in attendance at the meeting: R. S. Mackintosh, Alabama; W. E. Britton, Connecticut; Wesley Webb, Delaware; H. E. Summers, Iowa; J. B. S. Norton, T. B. Symons, Maryland; F. C. Washburn, Minnesota; C. M. Weed, New Hampshire; J. B. Smith, New Jersey; E. P. Felt, G. A. Atwood, New York; A. F. Burgess, Ohio; H. A. Surface, E. B. Engel, Pennsylvania; W. B. Alwood, Virginia; W. E. Rumsey, F. C. Johnson, West Virginia.

The United States Department of Agriculture was also represented by Messrs. Scott, Hopkins, Wilcox, Piper, Marlatt, and Kotinsky, and W. G. Johnson, of the American Agriculturist, was also present.

The time for further meetings was set at 9 a. m. and 2 p. m., when not conflicting with the meetings of the Association of Agricultural Colleges and Experiment Stations, until the business of the association was completed.

The report of the previously appointed committee on legislation was given by Doctor Smith. The committee made no formal report, but reported progress.

The questions announced on the programme were taken up for discussion, as follows:

Question 1—"What provisions in our inspection law will be likely to prove unconstitutional if attacked?"

The question was discussed by Messrs. Atwood, Scott, Norton, Rumsey, Burgess, Washburn, and Alwood, and Doctor Alwood was appointed to draft resolutions on the question discussed.

The subjects of fumigation, license, destruction of property, and discrimination against parties in other States were taken up and discussed.

Adjournment.

The next session was held at 2 p. m., Tuesday. The following resolutions were reported by Doctor Alwood, and were adopted:

"Resolved, That it is the opinion of the American Association of Horticultural Inspectors that no State law should contain any provision which in any way discriminates against nurserymen of other States.

"Resolved, further, That no State should make fumigation or other treatment of nursery stock a condition precedent to its admission into that State; but that a requirement that no stock shall be distributed within the State until it has been fumigated or otherwise treated is just and proper whenever a similar requirement is made of local nurserymen."

Question 2 on the programme—"The attitude of nurserymen's associations toward inspection laws"—was taken up for discussion. The reports of the National Nurserymen's committee on the subject were read as published in the National Nurseryman.

The subject was discussed by Messrs. Smith, Alwood, Scott, Atwood, Norton, and Burgess.

The discussion showed a general tendency of nurserymen and inspectors to cooperate in the suppression of insect pests and plant diseases, although some friction frequently arises.

The question of the part which is taken by professional scientists in connection with the enforcement of inspection laws was discussed, and the following resolution adopted:

“Resolved, That in the opinion of the American Association of Horticultural Inspectors the specialists employed under the crop-pest laws of the several States ought not to be required to attend to the details of prosecution, either civil or criminal, which may arise through violation of these laws.”

The third question—“To what protection is a nurseryman entitled as against scale infested surroundings?”—was discussed by Messrs. Symons, Alwood, Smith, Britton, Weed, Norton, Scott, Wilcox, Summers, and Piper.

The trend of the discussion was that it is hardly feasible to attempt to keep nursery stock free from scale with infested surroundings, but that the authorities in charge of the suppression of these insects should protect the nurserymen as much as possible against infested surroundings, and in some States the practice has been to commence cleaning up infested orchards and premises around nurseries. It was thought that while it is necessary that nursery premises should be kept more clean than others the nurserymen deserve protection from infestation from adjoining premises.

Adjournment.

The next session met at 9.15 a. m., Wednesday.

Question 4—“What is the status of fumigation in justifying the sale of nursery stock exposed to infestation?”—was discussed by Messrs. Engel, Britton, Mackintosh, Norton, Webb, Summers, Smith, Atwood, Burgess, Surface, Rumsey, Johnson, Symons, Weed, and Felt.

It was the expression of the members that fumigation was the best safeguard we now have against infestation, but many thought an inspection by which visibly infested trees would be thrown out was advisable, since fumigation can not always be made absolutely effective. Special care should be taken that the materials used in fumigation are of the proper strength, and if possible they should be used under the supervision of competent authority.

The question of the effectiveness of fumigation against woolly aphis was discussed, with the decision that it was a perfect safeguard except against the eggs of this insect, which are not killed by it.

The question of what should be done in infested orchards was discussed, showing a wide range of recent experience in the East with the lime and sulphur wash which is now being much recommended as the most effective treatment for scale in orchards in the East.

The effectiveness of this treatment against the leaf curl and other fungus diseases was brought out.

A motion was carried to continue the organization under the following officers: S. A. Forbes, chairman; John B. Smith, vice-chairman, and J. B. S. Norton, secretary.

Adjournment.

The next session was held at 4 p. m. Various questions concerning San Jose scale, and the use of the lime and sulphur wash were discussed by Messrs. Washburn, Weed, Surface, Scott, Piper, Smith, Summers, Felt, and Alwood.

A motion was carried that the association advise the use of the formula 1-2-4 in fumigating with hydrocyanic-acid gas.

The following resolutions were adopted:

“Whereas during recent years the dissemination of certain species of insects and fungi on nursery stock has resulted in the rapid spread of injurious insect pests and plant diseases; and

“Whereas many of the States of the United States and the Dominion of

Canada have now passed laws designed to protect purchasers of nursery stock from injury and loss by reason of infested or diseased nursery plants; and

"Whereas the enforcement of these laws has been in some instances considered hurtful to the interests of nurserymen and has led to some antagonism: Therefore,

"Be it resolved by the American Association of Horticultural Inspectors, That while they consider that the enforcement of reasonable crop pest laws is imperatively needed, both for the protection of the nurserymen and the fruit growers, they also believe that it is now possible, in view of the large experience and data at our command, so to frame the inspection laws and regulations for their execution as to protect the interests of both the nurserymen and the fruit growers; Therefore,

"Be it further resolved, That we invite such conference with the official nurserymen's associations as will lead to better relations, and so far as practicable to uniformity of practice on the part of the official inspectors."

Mr. Kotinsky, of the Division of Entomology, presented a review of a Russian paper on the inoculation of trees for the prevention of attacks by insects and other fungi.

Adjournment sine die.

FOURTH ANNUAL MEETING.^a

The association met with the Association of Agricultural Colleges and Experiment Stations at the Shoreham, Washington, D. C., November 14-16, 1905.

The meeting was attended by 33 persons, 22 States and the District of Columbia being represented. Those present were:

R. S. Woglum, Raleigh, N. C.; S. A. Forbes, Urbana, Ill.; H. E. Summers, Ames, Iowa; Wesley Webb, Dover, Del.; W. E. Rumsey, Morgantown, W. Va.; Wilmon Newell, Shreveport, La.; J. B. S. Norton, College Park, Md.; O. E. Stene, Kingston, R. I.; L. R. Taft, Agricultural College, Mich.; E. P. Taylor, Urbana, Ill.; George G. Atwood, Albany, N. Y.; L. O. Howard, Washington, D. C.; P. L. Hulsted, Blauvelt, N. Y.; C. P. Gillette, Fort Collins, Colo.; J. L. Phillips, Blacksburg, Va.; A. L. Quaintance, E. V. Wilcox, Washington, D. C.; R. I. Smith, Atlanta, Ga.; E. P. Sandsten, Madison, Wis.; James Troop, Lafayette, Ind.; John B. Smith, New Brunswick, N. J.; R. W. Braucher, Neoga, Ill.; Fred E. Brooks, F. C. Johnson, Morgantown, W. Va.; Gordon M. Bentley, Knoxville, Tenn.; E. D. Sanderson, Durham, N. H.; A. F. Burgess, Columbus, Ohio; A. B. Gahan, College Park, Md.; C. L. Marlatt, Washington, D. C.; Charles E. Chambliss, Clemson College, S. C.; H. A. Surface, Harrisburg, Pa.; T. B. Symons, College Park, Md.; R. S. Mackintosh, Auburn, Ala.

The meeting was called to order at 10.20 a. m., Tuesday, by Chairman Forbes.

The minutes of the previous meeting were read by the chairman and approved.

On motion representatives of the National Nurserymen's Association were allowed access to the meetings and all discussions of general interest.

Mr. Albertson, president of the American Association of Nurserymen, responded in a few words and, thanking the association, asked for a hearing later.

The topics announced for discussion were taken up.

The first discussion was on uniformity in nursery inspection laws and requirements concerning fumigation.

The discussion resulted in the adoption of the following resolution:

^a No meeting of the association was held in 1904.

“Resolved, That it is the sense of those present that all nursery stock be fumigated before being planted.”

An amendment to except regions where San Jose scale is believed to be absent was lost.

After adjournment the association met at 4 p. m. and took up the discussion of the license system for nurserymen. The discussions were participated in by Mr. Albertson and Col. C. L. Watrous, representing the American Association of Nurserymen. The following resolutions were adopted:

“Resolved, That the former action of this association, that nurserymen should not be required to pay the ordinary expenses of inspection, be reaffirmed.

“Resolved, That it is the sense of those present that it is unjust for the authorities of any State to charge a license fee of nonresident nurserymen.

“Resolved, That it is the sense of those present that it is undesirable to establish a license system for resident nurserymen of a State.”

The tag system for outside nurserymen as required by some States was discussed—in particular, the hardships to nurserymen from lack of uniformity in the same—and a committee, consisting of Messrs. Taft, R. I. Smith, Sanderson, Burgess, and Mackintosh, was appointed to consider the question of uniformity of tags and report at this meeting.

The question was asked in sending out duplicate certificates as required by some States whether the inspecting officer furnish them or the nurserymen. Discussion showed that both systems were used in different States.

After adjournment the association met again at 7.30 p. m.

The distribution of San Jose scale in the nurseries and orchards was discussed for the respective States by the various representatives present, each giving an account of his methods of inspection and granting certificates and procedure in case infestation is found.

After adjournment, met again at 9 a. m., Wednesday.

A motion was carried to proceed to election of officers at the opening of the afternoon session.

The secretary was directed to have published all formal action taken at this meeting in the National Nurseryman and send abstracts to the members of the association.

The committee on uniform tags gave its report, and on motion the discussion was made the second order for the afternoon session.

The question of recent additions to our knowledge of insecticide measures against the San Jose scale was discussed. The general opinion was that the lime-sulphur wash is the cheapest and best, though some had good results with recent patent compounds.

The time for nursery inspection was discussed, and showed considerable variation. No new action was taken on this subject.

A committee of three was appointed to design a form for a uniform certificate and to prepare a list of pests to be considered in nursery inspection and report at the afternoon session.

After discussion of what constitutes a nursery the following resolution was adopted:

“Resolved, That a nursery, in the inspector’s sense, is a place where hardy fruit and ornamental trees, vines, shrubs, or plants are grown for sale or distribution.”

The attitude of commercial fruit growers toward inspection work for control of San Jose scale was discussed, and showed much interest toward keeping down the pest and preventing its introduction, but no alarm in regions where the scale has long been introduced and methods of control have it well in hand.

Information from various persons present showed that orchard inspection is carried on in six States.

On inquiry it did not develop that the scale has had much influence on pruning methods.

A paper by Prof. H. T. Fernald on "Inspection for gypsy and brown-tail moths" was read by the secretary.

Adjournment to 1.30 p. m.

On reassembling the election of officers resulted in the following: S. A. Forbes, chairman; John B. Smith, vice-chairman; A. F. Burgess, secretary.

The report of the committee on uniform tags was taken up and adopted, as follows:

"Resolved, That a committee of three be elected by ballot by this association to have charge of the issuing of one tag good to admit nursery stock into all States requiring tags. Said committee to elect a secretary, who shall secure a statement from the official inspectors of the State of each nursery wishing to do interstate business as to the exact conditions of the said nursery, and, if satisfactory, to issue the nurserymen the official tags of the committee at such cost as the committee may decide. In case the conditions of such nursery are such as to make allowing his interstate business doubtful the statement of the condition must be submitted to all members of the committee. The committee also recommends that a designated color of tags or certificates be used by this committee, and a separate color by all State inspectors for all other shipments of nursery stock not using interstate tags for each shipping year. And we recommend the adoption of this measure by all boards of control or States involved."

The specified committee was then elected by ballot, those receiving the highest number of votes being chosen, viz: S. A. Forbes, L. R. Taft, and A. F. Burgess.

Professor Taft having resigned, R. I. Smith was elected in his place on the committee.

On motion, the association voted to adjourn at the end of the Thursday morning session.

The following resolution was adopted, with instructions that the Secretary appoint the secretary and two others as the stated committee:

"Resolved, That the American Association of Horticultural Inspectors, through its secretary, respectfully requests the honorable Secretary of Agriculture that a revision of Bulletin No. 13, New Series, Division of Entomology, be published, giving brief explicit directions to nurserymen as to the method of compliance with the laws or regulations of each State, and the regulations of States in addition to their laws, and that the previous and present proceedings of this association be published in this bulletin, the same to be edited by a committee of this association and published under the supervision of the Chief of the Bureau of Entomology."

After discussion of crown gall the following resolution was adopted:

"Resolved, That it is the sense of those present that in the present state of our knowledge regarding crown gall it is advisable that all nursery trees and plants showing evidence of this disease at digging time should be destroyed."

The treatment for woolly aphis in the nursery was discussed. Most inspectors require them to be thrown out; some practice dipping.

The following resolution was adopted:

"Resolved, That the American Association of Horticultural Inspectors urges ample appropriations by Congress to control the spread of the gypsy moth; and

"Resolved, That this be communicated to the honorable Secretary of Agri-

culture and to the chairmen of the Committees of Agriculture of the House of Representatives and Senate of the United States by the secretary of this association; and

“Resolved, That a committee of this association be appointed, which shall cooperate in drafting and aid in every way possible the passage of such legislation, and report at the next meeting of this association.”

After which, adjournment was taken to 9 a. m., Thursday.

On Thursday morning, after discussion, the report of the committee on uniform certificate was adopted, as follows:

“Resolved, That the following form shall be the uniform certificate for adoption:

“ ‘This is to certify that, in accordance with chapter —, the nursery stock for sale by —, of —, has been inspected by a duly authorized inspector and has been found apparently free from dangerously injurious insects and plant diseases.’ ”

“ ‘Invalid after July 1, 190—.’ ”

On motion, the committee was continued to prepare a uniform list of pests.

Professor Forbes reported, for the recently elected tag committee, the great difficulties of putting into practice the required duties of the committee.

The following resolutions were adopted, after which the association adjourned:

“Resolved by the American Association of Horticultural Inspectors, That whereas a committee of the American Association of Nurserymen has at this meeting requested that a delegation from this association be instructed to attend the annual meeting of the said Nurserymen’s Association, at Dallas, Tex., June 13–15, 1906, to consider matters of vital common interest relative to the regulations concerning the control of nursery stock, the appointment of Professor Newell, of Louisiana; Professor Smith, of Georgia, and Professor Mackintosh, of Alabama, be made to form such a delegation, and that the proper boards in their respective States be informed of this action, with the recommendation that provision be made by them for the expense incident in attending the aforesaid meeting.

“Resolved, That the time and place of our next meeting be left to the officers of this association.”



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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY—BULLETIN No. 62.

L. O. HOWARD, Entomologist and Chief of Bureau.

THE SAN JOSE OR CHINESE SCALE.

BY

^{Charles}
C. L. MARLATT,

Entomologist and Acting Chief in Absence of Chief.

ISSUED DECEMBER 5, 1906.



WASHINGTON:

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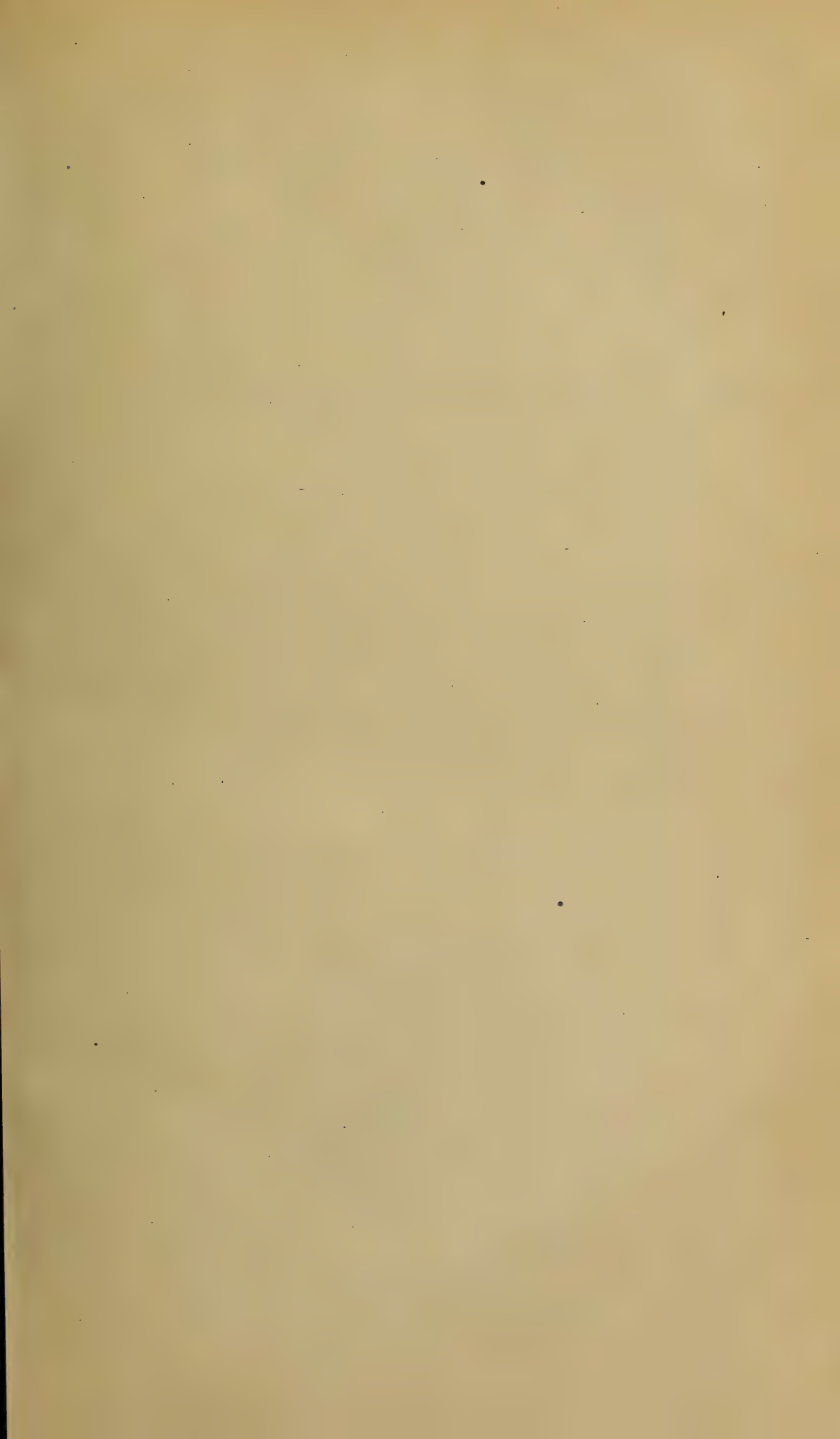
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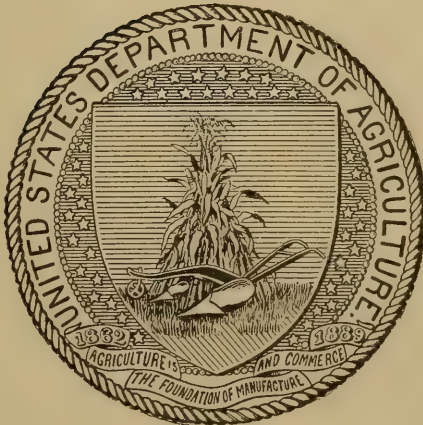
THE SAN JOSE OR CHINESE SCALE.

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1906.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., August 31, 1906.

SIR: I have the honor to submit for publication a manuscript entitled "The San Jose or Chinese Scale," which is a thoro revision of the previous publications on this subject issued by the Department, namely, Bulletins Nos. 3 and 12, new series, of this office. In spite of the large number of articles which have been published concerning this insect in experiment station bulletins and in journals and magazines, there is a distinct need for a comprehensive treatment of this most important subject, and this need, I think, has been met in an excellent way by Mr. Marlatt in this manuscript. I recommend that it be published as Bulletin No. 62 of this Bureau.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

PREFACE.

Bulletin No. 3 (new series) of this office, giving a full account of the San Jose scale, was presented for publication, under the joint authorship of Doctor Howard and the writer, November 29, 1895, and included the results of two years of very thoro study of the San Jose scale. Two years later Doctor Howard issued, as Bulletin No. 12 (new series), a record of the work to the end of 1897, more particularly giving an account of the spread of the San Jose scale in the United States during the intervening period and the results of remedial work by this office and the different experiment stations, together with additions to the bibliography. It has now been more than ten years since the publication of the larger bulletin giving the full life history of this scale pest, and it seems advisable to issue a new general publication to include in one bulletin the considerable additions which have been made to our information on the subject.

The portion of Bulletin 3 giving the life history of the insect was worked out with great minuteness and is reproduced with little change. The facts relating to the original home of the insect, as discovered by the writer in 1901 in the course of explorations in China and Japan, are incorporated in this bulletin, and the distribution of the insect has been brought down to date.

The literature of the last ten years relating to the San Jose scale is of enormous volume, probably exceeding that relating to any other insect pest. Most of this literature relates, however, to the strictly economic phase of the subject—namely, distribution, injury to plants, and the means of control—together with legal enactments of various foreign countries and of the several States of the Union. The listing of all the publications on the San Jose scale subsequent to its appearance in the East in 1893 would make a bulletin of itself and would probably serve no very useful purpose, and therefore no bibliography is given in this publication. The earlier writings on this insect are, however, recorded in Bulletins 3 and 12.

The early experimental work with remedies given in Bulletin 3 is omitted, and no effort has been made to summarize the enormous body of reports on work with remedies recorded in the publications of different experiment stations in this country. The results of the later work with remedies conducted by this Bureau are to be found

in the five different editions of Circular 42, relating to the control of the San Jose scale, and in the two editions of Circular 52, relating to the lime, sulfur, and salt wash, and also in several articles in the miscellaneous bulletins of the Bureau.

Inasmuch as a good deal of the present bulletin has been rewritten, and as most of the added matter is from articles published by the writer, at the suggestion of Doctor Howard this publication is issued as a new bulletin of the Bureau series and under single authorship. Considerable matter, however, from Bulletin 3, notably that relating to life history and habits, has been used, as already indicated, with little change; this publication is largely, therefore, a compilation, with the aim of bringing the subject down to date and making it complete and available as a means of present information on the habits and status of this important scale insect pest.

The portion on true parasites (pp. 58-62) was kindly prepared by Doctor Howard, who has long been the authority on this group of parasitic four-winged flies.

C. L. M.

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THE SAN JOSE OR CHINESE SCALE.

INTRODUCTION.

The San Jose scale is now known to be of Chinese origin. Its name is derived from its first point of colonization in America, namely, at San Jose, Cal., and is, in a sense, undesirable, as giving an unmerited notoriety to the district in California which had the misfortune of being the accidental place to first harbor it. A more appropriate designation is the *Chinese scale*, but it is improbable that a new name will ever be adopted for an insect which has become so thoroly well known and exploited under its original designation.

Probably no other insect has had so much notoriety as has this species, and certainly none has assumed so great an international importance, as indicated by the vast amount of interstate and foreign legislation which has been enacted relative to it. In all the earlier publications of this office, beginning with Comstock's original description and note in the Report of the Department of Agriculture for 1880, the very great economic importance and capacity for harm of this scale insect has been commented upon and the fact that there is perhaps no insect capable of causing greater damage to fruit interests in the United States than the San Jose or pernicious scale.

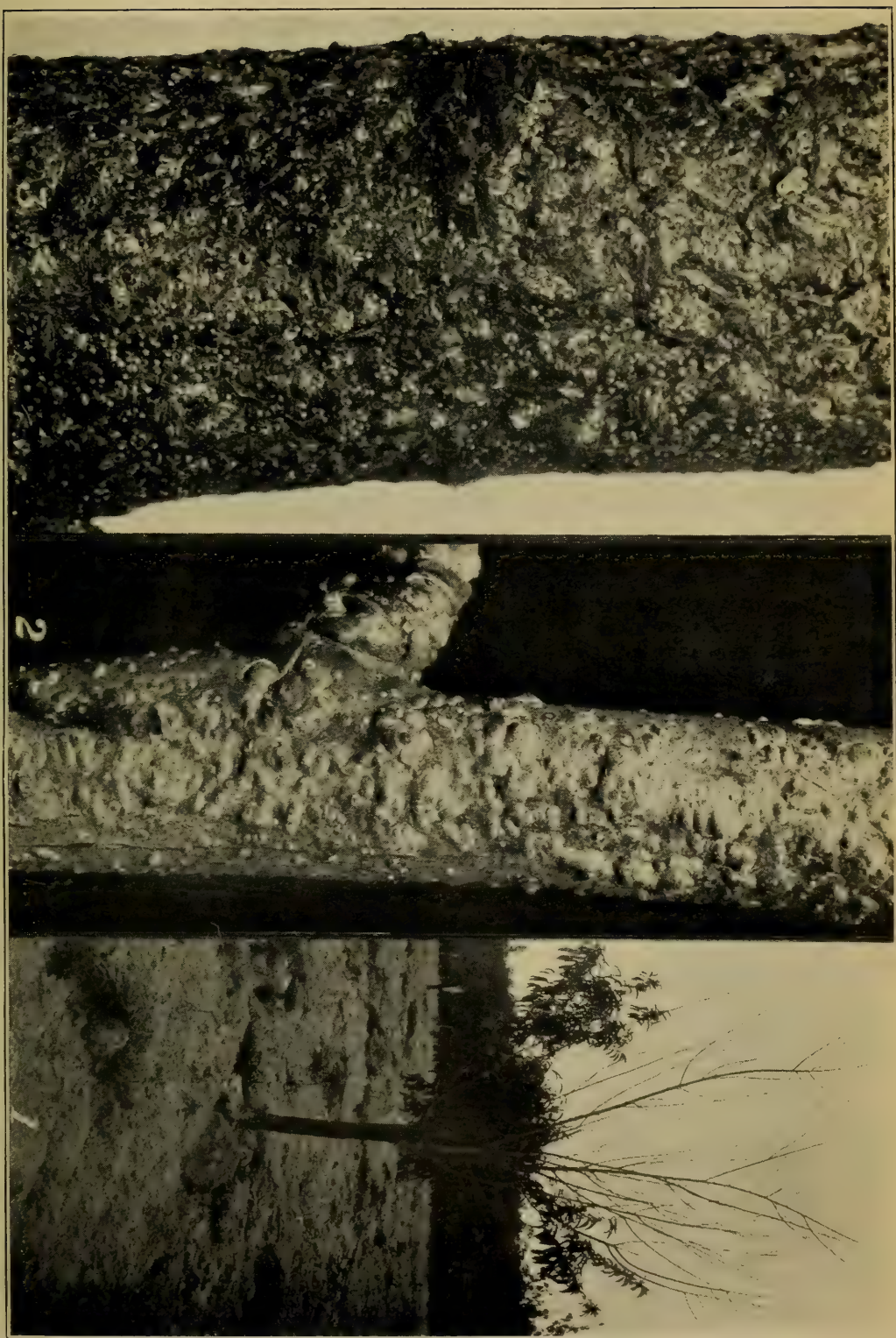
It is inconspicuous and often for a time passes unnoticed or unrecognized. Meanwhile its enormous fecundity enables it to overspread the trunk, limbs, foliage, and fruit of the tree attacked (Pls. I, VI), so that it is only a question of two or three years, unless proper remedial steps be taken, before the condition of the plant becomes hopeless or its death is brought about. In capacity for harm this species probably exceeds any other scale insect known, and it attacks practically all deciduous plants, both those grown for fruit and the ornamentals. Its economic importance is further increased by the ease with which it is distributed over wide districts thru the agency of nursery stock, and the difficulty and, as a rule, impossibility of exterminating it where once introduced. Its capacity for evil, which was recognized in its earlier work on the Pacific coast, was at once even more strikingly demonstrated on its first appearance in the East, and before measures of control were undertaken it was much more disastrous in peach orchards of Maryland, New Jersey, and other eastern and southern States than in California and the West.

PRESENT STATUS OF THE PROBLEM.

The estimates given in our early publications of the seriousness of this pest have been more than borne out by the experience of the last ten years. Since its appearance on the Atlantic seaboard in the early nineties it has, in spite of all efforts at control in nurseries and by State quarantine, spread well over the eastern and middle United States and into Canada, so that there are now very few regions where fruit growing is at all important in which it has not gained permanent foothold. Maine and a few of the middle western States have not so far reported this scale insect, but it is only a question of time when it will complete its extension over the entire fruit-growing areas of North America within its climatic range.

Nevertheless the San Jose scale has not been an unmitigated scourge, and the active investigations by the Bureau of Entomology of the United States Department of Agriculture and the entomologists of the State experiment stations have demonstrated the practicability of several means of control, and particularly of the lime-sulfur wash; so that the fears aroused by this scale insect are rapidly subsiding and it no longer is considered as an insurmountable obstacle to the growth of deciduous fruits. In the case of certain fruits, as, for example, the peach, it has been found that the lime-sulfur wash has a very great value as a fungicide, and so much so that some growers are recommending its use whether the San Jose scale be present in the orchard or not. Furthermore, the presence of this scale has led to much more careful methods on the part of nurserymen and in the planting and care of stock, thus raising the standard and giving the intelligent and conscientious, painstaking grower a distinct advantage over his careless neighbor. The results in the East, in other words, are following rather closely on the experience in California and elsewhere on the Pacific coast, where the San Jose scale, long looked upon as the worst menace of the deciduous-fruit interests, is now not necessarily so regarded, and the same benefits have come to California fruit growing by the use of better methods of planting, pruning, and care.

This does not mean that the San Jose scale is to be looked upon as a blessing. The benefits of spraying are not always uniform, and are less perhaps in the case of the apple than they are with the peach, pear, and the smoother barked fruit trees. The necessity of annual spraying of the trees is now clearly shown, and this amounts to a very large annual cost, partly offset, as already indicated, by the fungicidal value of the standard lime-sulfur application. Nevertheless, neither the injuries from the scale nor the cost of treatment have put more than a temporary check upon the advance of the fruit industry, and great confidence is being expressed by the larger commercial growers who follow out the remedies with greatest thoroughness and in the most



THE SAN JOSE SCALE AND ITS WORK.

Fig. 1.—Peach tree with top killed by the scale.

Fig. 2.—Peach twig; moderately infested, showing male and female scale.

Fig. 3.—Peach

limb badly infested with scale.

Fig. 2, enlarged 4 times; fig. 3, enlarged twice. (From Quaintance.)

practical manner, and who consequently get the best results. It is now largely a matter of getting the owners of small orchards to follow a regular annual system of spraying their trees.

The presence of San Jose scale has not only resulted in a considerable increase of information as to remedies and to improvements in the methods of culture which directly relate to itself, but it has been a stimulus to improved methods and more efficient means of control of other common destructive insects, has demonstrated the necessity of watchfulness against the introduction of similar pests from foreign sources, and has led to active efforts in the direction of quarantine and inspection on the part of practically all of the several States of the Union.

The control of the San Jose scale by parasitic and predaceous enemies is increasing all the time, but there seems to be no likelihood that either such natural enemies as are now in this country or those which may hereafter be imported will ever do more than merely lessen the abundance of the scale. In other words, from past experience and from a large acquaintance with other similar scale pests it is extremely improbable that even under the most favorable circumstances will such natural enemies reduce this scale as much as would one thoro treatment with the lime-sulfur wash or other standard remedy. The insect enemy of the scale can only exist when it has scale food; hence a normal balance is very soon reached in which the scale and natural enemy fluctuate in relative abundance. A complete extermination of the scale insect or host will rarely if ever be accomplished, and there will probably always be enough scale present to cause spotted and unmarketable fruit. This does not mean that such enemies are not going to be helpful. They will decrease the virulence and destructiveness of the scale, but to get clean fruit it will probably be always necessary to spray. A very few scale on a tree will cause spotted fruit even when they may not be abundant enough to do the tree itself material injury. The fact that a large, succulent scale insect like the fluted scale of California has been controlled by a ladybird enemy does not necessarily allow one to hope for the same result with the San Jose scale. The ladybird and other enemies introduced into California to control scales similar to the San Jose scale have not succeeded in the same measure at all. This statement is made to correct hopes which may be aroused by certain popular articles which have recently appeared on the subject of parasites.

In brief, therefore, the San Jose scale must be recognized as a permanent condition to be met in the growth of deciduous fruits. The greatest care should always be taken in the purchase of nursery stock to see that it is absolutely free from infestation, and preferably also that it carries with it a certificate of fumigation. Orchards should be sprayed according to well-established methods annually as soon as the

first sign of infestation is found. Fruit growers and others interested have come to accept this conclusion and are facing the San Jose scale problem as one to be regularly dealt with, as with other established insect enemies of fruits. The range of food plants of this scale is so great that local extermination is out of the question, and it is recognized as useless to destroy orchards or new stock because of slight infestation. The San Jose scale will have so soon gained foothold on many ornamental and wild plants that such destruction of orchards would be of no avail, and new stock would be very quickly reinfested from near-by sources.

ORIGIN OF THE INSECT.

The San Jose scale was first established in this country in the early seventies at San Jose, Cal., in the grounds of Mr. James Lick.

Following the studies of Professor Comstock of this pest in California in 1880, efforts have been made to determine whence the original infestation came; in other words, to locate the native home of this insect. The importance of discovering the origin of this scale arises from the now well-known fact that where an insect is native it is normally kept in check and prevented from assuming any very destructive features, or at least maintaining such conditions over a very long time, by natural enemies, either parasitic or predaceous insects or fungous or other diseases. Mr. Lick, in whose orchard the scale first appeared, was a great lover of plants, and imported trees and shrubs for the ornamentation of his grounds from foreign countries, and it was very naturally inferred that in some of these importations he had introduced this insect. Before this investigation started, however, Mr. Lick had died, and it was impossible to trace his importations. That the scale was not European in origin was evident; otherwise it would undoubtedly have come to this country long before with the numerous importations of stock from Europe. Its original home was therefore naturally placed in some eastern country. In the course of the investigation it was found that the San Jose scale occurred in the Hawaiian Islands, in Chile, in Japan, and in Australia.* In the case of the Hawaiian Islands it was conclusively shown, however, that it had been carried there on stock from California. The evidence relating to Chile and Australia was of a similar nature—namely, that it had come to those countries comparatively recently on imported stock. Its occurrence in Japan was not discovered until 1897, and the evidence was far from being conclusive that it was indigenous in that country; nevertheless the belief that Japan was the source of this scale came to be rather generally accepted. The objections to it were voiced by Doctor Howard and the writer in an article read before the Association of

* See Bul. No. 3, new series, Div. Ent., U. S. Dept. Agric., pp. 10-12, 1896.

Economic Entomologists in 1899,^a showing that at best the evidence left the question open. That this scale insect probably had its original home in China or Japan seemed, however, to be pretty conclusively indicated by the process of exclusion of other countries. Mr. Koebele's investigations of the Asiatic tropical regions and Australia and New Zealand had been fairly thoro, yet without finding it on native plants, and, furthermore, it was not known to occur in South Africa. The evidence pointing toward Japan and China was further emphasized by the fact that the San Jose scale is, by its relationship and distribution, an insect of the temperate regions rather than of the Tropics.

EXPLORATIONS IN EASTERN ASIA.

With the hope of settling the disputed point of the origin of the San Jose scale, and, if the native home of the species were discovered, to study, collect, and import beneficial insects to control this pest in America, the writer, in 1901-2, made a trip of exploration in Japan, China, and other Eastern countries, lasting over a year. The accompanying map (Pl. II) illustrates the regions explored. Six months were devoted to a very thoro exploration of the different islands of the Japanese Empire, and three months to China, with shorter periods in other regions. The explorations in China and Japan are the only ones which bear especially on the San Jose scale problem.

EXPLORATIONS IN JAPAN.

During the time spent in Japan, from April to September, 1901, the writer visited some forty-two provinces, and explored all the principal islands, representing a stretch in latitude the equivalent of from northern Maine to Florida. Altogether these explorations enabled him to make a pretty correct judgment on the San Jose scale problem in Japan. Japan is not especially a horticultural country. Her comparatively enormous population of 46,000,000 compels the growth of cereals and other necessities of life wherever possible. Very little land, therefore, is devoted to fruit raising, and fruits are considered as luxuries. Nevertheless, practically every dwelling house in Japan has a little dooryard or kitchen garden in which are single examples of cherry, plum, peach, persimmon, and other trees. Furthermore, the roadways and temple grounds and streets are lined with cherry and plum trees, planted for bloom and ornament and not for fruit. There are orchard districts in Japan of limited extent. In northern and central Japan there are a few peach orchards and a few orchards of native pears, and in southern Japan small orchards of orange, pomelo, walnut, and other fruits. In old Japan the chief deciduous fruit is a native pear grown in small patches of from a fraction of an

^a See Bul. No. 20, new series, Div. Ent., U. S. Dept. Agric., pp. 36-39, 1899.

acre to 2 or 3 acres in extent. These are trained low on overhead trellises (Pl. III), and at a short distance look like vineyards. There are several districts where such orchards occur in considerable numbers. These orchards are very ancient, many of them having trees more than one hundred years old. If the San Jose scale were native to Japan it would occur in these pear orchards, the pear being one of the favorite food plants of this scale insect.

In northern Japan, including the island of Hokkaido, and the northern end of the main island, Hondo, apple raising has been introduced in modern times very much on the lines followed in this country. Prior to the opening of Japan to foreign commerce and exploration the apple as an edible fruit was unknown in that country. The orchards in northern Japan are chiefly, therefore, of American origin and represent American varieties. Most of the stock came from California, and much of it was undoubtedly infested with San Jose scale when it was received. There is, therefore, thruout these northern apple orchards a mild infestation with this scale. The Japanese are very enthusiastic in their efforts to gain all the benefits of western civilization, and this is shown in horticultural as well as in other fields. The three leading nurseries, therefore, of Japan have been very active during the last twenty or thirty years in importing the different varieties of pear, peach, and apple from America, and all three of these nursery districts have become infested with San Jose scale, evidently from such importations from California, where the scale has been widely distributed for thirty years. Outside these nurseries, however, in central and southern Japan, the San Jose scale did not occur, except where it had been introduced on new stock from the nurseries referred to. The old native pear orchards were free from scale, except where replants had been made of American varieties, or new native stock, to fill in breaks in the orchards. The infestation was very often just beginning and immediately surrounded the replants. In all Japan, therefore, in the little house gardens and temple grounds where were cherry, plum, and other trees suitable for San Jose scale, this insect did not occur, except where the evidence was very plain of its recent introduction as indicated. Without going into details of the evidence, it is sufficient to say that the conditions in Japan are essentially the same as in this country. The San Jose scale is a recent comer. It was, in fact, not known in Japan prior to the year 1897, when its presence there was first determined, but it has now been scattered pretty widely by nursery stock, exactly as in this country, and occurs under similar conditions; in other words, only where it has been recently introduced. The investigation showed very distinctly that Japan could not be considered responsible for the San Jose scale.

The results and conclusions arrived at by the writer were afterwards fully confirmed by a very thoro and painstaking explora-





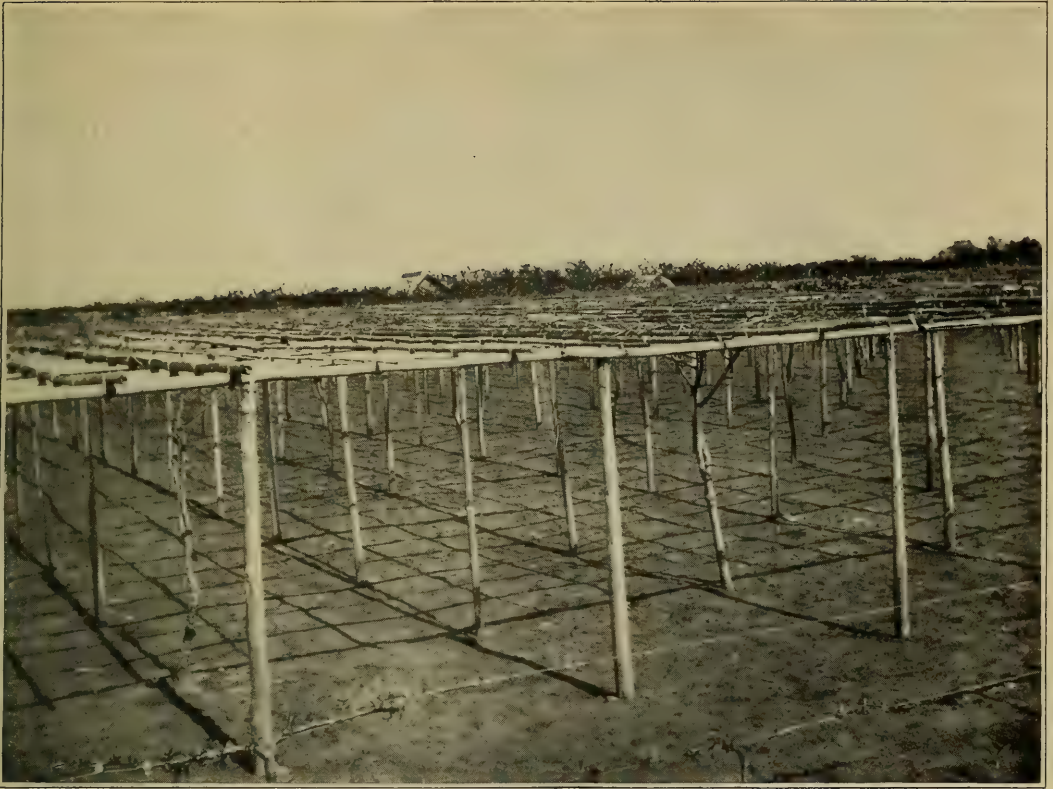


FIG. 1.—JAPANESE APPLE ORCHARD, SHOWING TRELLIS METHOD OF TRAINING.
(AUTHOR'S ILLUSTRATION.)



FIG. 2.—OLD NATIVE PEAR ORCHARD OF JAPAN, SHOWING METHOD OF TRAINING.
(AUTHOR'S ILLUSTRATION.)

tion of the entire Japanese Empire conducted by Japanese entomologists under the authority of the Imperial Agricultural Experiment Station in Japan. The publication giving the results of this investigation^a is a very interesting and valuable contribution to our knowledge of the subject, and is illustrated by numerous maps and figures.

EXPLORATIONS IN CHINA.

Investigations up to this point, while freeing Japan from the onus of giving the San Jose scale to the world, left the problem unsettled as to the original home of this insect. China remained as the most likely place of origin, and the writer proceeded to China to continue his explorations there. While in Japan a good deal of information was gained relative to fruit conditions in China, from English, German, and American residents who were spending the summer months in Japan to escape the rather trying climate of China. In brief, it may be stated that deciduous fruits are grown from the Shanghai region northward, the peach being practically the only fruit grown to any extent about Shanghai. The great apple district of China is the region lying back of the city of Chifu in the north. This apple-growing industry was started many years ago by a missionary, Doctor Nevius, and has assumed very considerable proportions and covers a good deal of the province of Shantung. Below Shanghai the orange and other subtropical fruits replace the deciduous varieties. North of Chifu native fruits only are grown, consisting of the native pear and peach, and such wild fruits as wild crab apples and an edible haw apple.

A very considerable exploration of the country lying immediately back of Shanghai was made in the course of a long house-boat trip. A great many peach orchards were examined and a good deal of miscellaneous fruit and other plants growing about house yards were inspected. Nowhere was there any evidence of the San Jose scale, nor were scale insects of any sort much to be seen. The climate of this region is unfavorable for such insects and they are normally killed out by fungous disease. The writer afterwards proceeded by boat to Chifu—a five-day ocean trip from Shanghai, and made a considerable exploration thruout the apple orchards of this region on horseback, visiting, among others, the original orchards planted by Doctor Nevius. In all these the San Jose scale was found scatteringly present, not, however, doing any special damage, and probably not enough to be noticed, if its possibility for evil was not so well established. The presence of the San Jose scale in this region did not, however, have any special significance, since much of the original

^aThe San Jose scale in Japan. Imperial Agricultural Experiment Station, Tokyo, 1904.

stock was obtained from California, and doubtless from nurseries which were infested with the scale.

The journey of exploration was continued northward to Tientsin and Pekin. In this region the San Jose scale was found on native plants also, including the flowering peach, a tree grown for ornament solely, and not for fruit, and notably on the native fruits in the markets in these cities.

The markets of Pekin were of especial interest in this connection. Pekin is the center and market for all the region lying to the north and west, and the streets (Pl. IV, fig. 2) devoted to the sale of fruits and other products in the Chinese city are one of the great show places. The fruit and nut products are brought into Pekin in little two-wheeled carts (Pl. IV, fig. 1), or more generally on camelback, great caravans of heavily loaded camels and streams of carts constantly entering the city with the products of the outlying provinces. One finds, therefore, in the markets of the Chinese city the fruit products of all northern China, and can study them at ease. All the district lying between Pekin and the great wall, north and west and east, has been most carefully explored and mapped by the foreign military authorities. From various individuals employed in this minute survey a great deal was learned relative to the fruit growing in the district indicated. Much of the fruit found in the markets of Pekin comes from the hill region leading up to the mountains separating China from Mongolia and Manchuria. These fruits are native apples, pears, and peaches, and the little haw apple already mentioned. Great quantities of these fruits were examined in the market, with the exception of the peach, which was then out of season, and later similar examinations were made at Tientsin. A very scanty but general infestation with San Jose scale was found on the different fruits examined. Perhaps one apple in a hundred would have a few of these scales about the blossom end and the same proportion was true of the haw apple and the native pear. Thruout the region where these fruits are grown there has been no introduction of foreign stock. The occurrence of the San Jose scale on these two fruits was conclusive evidence that in the region whence they came the San Jose scale is native. The scattering occurrence of the scale also indicated, as would be anticipated, that this pest in its native home is kept in check by natural means.

The investigations made at Shanghai, and later southward to Hong-kong, the Malay Peninsula, and Java, indicated that the San Jose scale in eastern Asia can not survive below Shanghai.

The special district where it is native and thrives is a fairly well shut-off region, which probably accounts for the failure of this insect to become a world pest ages ago. This district is the region leading up to the mountains and comprising the northern and northeastern



FIG. 1.—PONY FRUIT CART IN WHICH PRODUCTS OF THE HILL COUNTRY ARE BROUGHT INTO PEKIN, CHINA. (AUTHOR'S ILLUSTRATION.)



FIG. 2.—PORTION OF STREET DEVOTED TO SALE OF FRUITS IN PEKIN, CHINA. (AUTHOR'S ILLUSTRATION.)

[In foreground, fruit samples; in background, storehouses, also dromedaries employed to bring products from remote provinces.]

frontiers of China proper. Beyond the great wall on the north and west lies Mongolia, consisting chiefly of the vast Desert of Gobi. To the northeast, and separating the region from Manchuria and Korea, is the eastern Gobi Desert. To the south and east lies the great alluvial plain, the product of centuries of mud carried down by the Yellow River, a region where cereals only are grown. These are all effective barriers, and especially so when considered in connection with the political conditions of the past. We have, therefore, as the original home of this insect a naturally shut-off area from which it could not easily escape under the conditions prevailing up to our own times.

The means by which the San Jose scale came from China to America is a matter of interest. As previously stated, it is believed that this pest reached California on trees imported by the late James Lick. It is the writer's belief that Mr. Lick imported from China, possibly thru Doctor Nevius, with whom he was probably in correspondence, the flowering Chinese peach, and brought with it the San Jose scale to his premises. Undoubtedly this scale insect came to this country in some such way on ornamental stock from China.

RECORD OF THE SPREAD OF THE INSECT.

No attempt will be made to trace the details of the later extension of the San Jose scale, but the earlier history of this scale in the United States is well worthy of record as is also a summary at least of the means by which it became so widely and disastrously distributed so shortly after its first appearance on the Atlantic side of the Continent.

HISTORY IN CALIFORNIA AND THE WEST.

The spread of the San Jose scale from the point of original infestation in the San Jose Valley was somewhat rapid, its area increasing in every direction, but more rapidly toward the north and the west. By 1873 it had become a serious pest in orchards which had direct connection with that of Mr. Lick, and in 1880, when Professor Comstock studied it, he reported that he had never seen any other species so abundant and injurious as this was in certain orchards. As reported by Mr. Coquillett, it had extended as far west as San Francisco by 1883, but it had not reached important deciduous-fruit districts in southern California three years later. Prior to its reaching the East in 1886 or 1887 it had slowly extended its range on the Pacific coast and in States west of the Rocky Mountains, including California, Oregon, Washington, and Idaho on the north, and Nevada, Arizona, and New Mexico on the south. In the early nineties it had penetrated into British Columbia.

HISTORY IN THE EAST.

The general records of the discovery of the insect in the East are reproduced, with slight changes, from Bulletin 3.

The occurrence of the San Jose scale in the East was first discovered early in August, 1893, in the grounds of Dr. C. H. Hedges, of Charlottesville, Va. An infested pear had been sent by Doctor Hedges to Mr. Galloway, chief of the Division of Vegetable Physiology and Pathology of the Department of Agriculture, on the supposition that it was affected by a fungous disease. The fruit was submitted to the then acting entomologist, Doctor Howard, who immediately recognized the injury as due to the San Jose scale, and the startling and deplorable fact was established of the introduction into eastern orchards of this worst scourge of deciduous trees of the Pacific Slope, as well as the fact that it was evidently able to maintain itself in a supposedly less favorable climate. The importance of this discovery was at once realized, and two agents of the Bureau, Messrs. Schwarz and Coquillett, were detailed to make a thoro investigation. In conjunction with the State board of agriculture of Virginia and under the supervision of Mr. Coquillett a thoro fumigation with hydrocyanic acid gas was given to the infested trees and plants.

The introduction of the scale was subsequently traced to currant bushes purchased from a New Jersey firm.

In March, 1894, the presence of the scale was determined by Doctor Howard, at Riverside, Charles County, Md., in a rather large orchard situated on the river front, and including over two thousand peach and several hundred apple trees. This orchard was visited by the writer, who found that many of the trees were infested with the San Jose scale, large numbers having already perished. The infested stock was again in this instance traced to a New Jersey nursery. This orchard, on account of its proximity to Washington and the facilities thus afforded for experiment, was used by the Bureau in the testing of various washes for this scale.

During the same month (March, 1894) specimens of the San Jose scale were received from De Funiak Springs, Fla., thru the entomologist of the Florida Experiment Station, Mr. P. H. Rolfs. The late Mr. H. G. Hubbard, one of the assistants of the division, visited the infested locality and found the scales confined chiefly to peach and plum, occurring, however, in small numbers on Kieffer pear, pecan, and persimmon. Many thousands of trees were found to be infested, including nearly every orchard within a radius of 5 or 6 miles. The source of the infestation in this case was not definitely ascertained, but it was evident after examination that some infested nursery had sent a shipment of trees, and the indications were that

there had been repeated importations, the first indication of injury having been noted six years before.

On receipt of the Florida specimens Doctor Howard concluded that as the scales had been found in three such widely separated localities, and as the information gained from the owners of two of the affected orchards led to the supposition that the original stock had been obtained from a large eastern nursery, the probabilities were strong that the scale had established itself in many eastern points during the preceding five or six years. He therefore immediately prepared a circular of warning and had nearly 12,000 copies mailed early in April to all eastern agricultural newspapers and to very many eastern fruit growers. As a result of the issuing of this circular many new localities for the scale were ascertained, a widespread interest in the subject was aroused, and careful investigations were made in all the States to which there was any likelihood that the insect had been carried by nursery stock or other means.

By the end of August, 1894, the scale was known to occur in the following localities in the East: In a rather widely extended district in Florida, one locality in Virginia, three in Maryland, one in Indiana, two in Pennsylvania, many in New Jersey, and one in New York, on the east bank of the Hudson River a little below Albany. Very shortly afterwards, during the same summer, it was found on Long Island, occurring both in orchards and nurseries. Later in the fall the scale was found at three new localities in Maryland, and still later specimens were received from the extreme southern part of Georgia. In December Professor Webster reported receiving the scale from a large orchard district in southern Ohio, and a little later specimens were received from Jefferson County, Ind. The scale was found also near New Castle, Del., in January, 1895, and additional localities were discovered during the following spring and summer of 1895 in some of the States mentioned, as also in Alabama, Louisiana, and Massachusetts. In nearly every instance the source of infestation in the East was the same, namely, one or the other of two important New Jersey nurseries.

PRINCIPAL SOURCES OF INFESTATION IN THE EAST.

As stated, nearly all the eastern occurrences of the San Jose scale were traced to two large New Jersey nurseries, from which infested stock had unwittingly been sent out broadcast for certainly six or seven years. The damage thus done to the fruit interests of the East by these nurserymen can hardly be estimated, and yet it must be admitted that they were, in a measure, blameless, since they were undoubtedly entirely unaware of the dangerous character of the scale insect which infested their stock. We can hardly avoid the conclusion, however,

that they were aware that they were distributing diseased stock, since to deny this presupposes that the stock received no examination. If the scale was noticed it was doubtless supposed to be one of the common eastern species, which, while bad enough, are of little importance compared with the San Jose scale.

The two nurseries responsible for the original eastern introduction of the scale became infested in the same way. Either in 1886 or 1887, in the endeavor to secure a thoroly curculio-proof plum, both of these nurseries introduced from California an improved Japanese variety, the Kelsey, obtained from the San Jose district. We have the statement from the proprietors of one of the nurseries that the plum trees in question were secured in the spring of 1887 from San Jose, Cal., and were shipped thru the agency of a Missouri nursery company, which acted in this instance apparently as a mere transmitting agent. The trees were unquestionably thoroly infested when received, did not thrive, and in both cases most of them were ultimately taken out and destroyed. The stock, however, had been multiplied by nursery methods, and from the original stock, and that subsequently obtained, the scale spread more or less completely thruout both of the nurseries in question. Both of these firms, when the nature of the infestation was brought to their attention and the seriousness of the damage they were doing was made apparent to them, undertook measures to exterminate the scale.

In addition to the two prominent nurseries mentioned, several smaller nurseries in the East were found to harbor this scale. Some of these had been recently infested, but in others the infestation was of long standing. Three nurseries of the latter class were located on Long Island, and apparently received their original scales from New Jersey; one in Florida, reported by Prof. P. H. Rolfs, and two in Georgia apparently received infested stock from eastern sources, and one or more each in Louisiana, Mississippi, and Alabama became infested with the scale thru pear stock coming from Lewiston, Idaho. In Massachusetts there were infested nurseries at Cambridge and Bedford, the origin of the scale in these cases being obscure; and a nursery in Missouri was under suspicion as having been the agency thru which the original infested Japanese plums were transmitted to eastern nurseries. Two infested nurseries were known to exist in Maryland also.

SUMMARY, BY STATES AND TERRITORIES, OF DISTRIBUTION AND PRESENT CONDITION.

The detailed facts relating to the first introduction of the San Jose scale into the several States are given in Bulletins 3 and 12, and with greater minuteness in the various publications of the experiment stations of the several States involved. The distribution has now become

so general in most of the States where the San Jose scale has occurred for a number of years that it is impracticable to indicate the different points of infestation, and even in the States worst infested many orchards are free from the scale; but if an attempt was made to graphically picture the distribution on a map, the points of infestation would be so numerous as to give the appearance of absolutely complete infestation. The publications cited may be referred to, therefore, for the more detailed and complete records. A mere statement of the present general status of the San Jose scale in the several States in which it occurs will now be given. This statement is based on replies to a circular letter of inquiry sent to State entomologists and experiment station officers in May of this year.



FIG. 1.—Map of the United States, showing localities known to have been infested with the San Jose scale up to 1896. (Original.)

It is interesting for comparison to reproduce the map (fig. 1) showing the known distribution at the time of the publication of Bulletin 3 in 1896, when the scale was reported in only 20 States and in comparatively few localities in each, with the single exception of New Jersey, which had been most energetically inspected by Dr. John B. Smith and found to be very generally infested. Bulletin 12 records the scale occurring in 33 States and also in the District of Columbia and Canada, and in very many new localities in all of the States previously recorded as harboring the scale. The number of actual records of the San Jose scale now available are many hundredfold what they were at the time of the publication of Bulletin 12 at the beginning of the year 1898.

There are still a few States in which the San Jose scale does not now occur or has not been reported, namely, Colorado, Maine, Minne-

sota, Nebraska, North and South Dakota, Wisconsin, and Wyoming. It probably occurs in some of these States, however, altho it has so far escaped notice.

ALABAMA.

The occurrence of the San Jose scale in Alabama was first indicated in April, 1885, by material received from Prof. J. W. Hoffman, of the Tuskegee Institute, Tuskegee. As now reported by Mr. R. S. Mackintosh, State horticulturist, the infestation is scattering thruout the State, but chiefly along some of the main railroad lines, and most of the infested orchards became so before people knew about the scale and before the adoption of quarantine measures to prevent its introduction and spread.

ARIZONA.

The San Jose scale has been present in Arizona in the older orchards of the Salt River Valley for more than twenty years. Director R. H. Forbes, of the agricultural experiment station, now reports that this scale insect has rather dropt out of sight, probably because of the succession of excessively hot dry years from 1899 to 1904, inclusive. During this period a large proportion of the deciduous fruit trees, including almonds, peaches, pears, apricots, and apples, perished, apparently from lack of irrigating water and partly from the effect of extremely high temperature and dryness.

ARKANSAS.

The presence of the San Jose scale in this State is recorded in Bulletin 12 (1898), on material reported by Professor Stinson. Mr. C. F. Adams, the entomologist of the agricultural experiment station, now states that the spread of this insect is still not very general; that it has been reported from several counties, and that he has seen it in two florists' establishments, but has not found it in any of his nursery inspection.

CALIFORNIA.

The San Jose scale has, of course, long been generally disseminated thruout the State. Prof. C. W. Woodworth, entomologist of the agricultural experiment station, now reports that it does not occur at Berkeley, but probably occurs everywhere else in the State where fruit trees are grown, except in isolated plantings in the foothill regions. Usually it is not seriously troublesome, tho it may increase rapidly at any time and become a pest. The uniform treatment with the lime, sulfur, and salt wash keeps it in check, and parasitism is often fairly efficient. In some districts, as about San Jose, where it has almost disappeared, the result may be due both to parasitism and to some

obscure form of disease as well as to the lime-sulfur treatment. In southern California it is particularly troublesome in apple orchards. The principal variety of apple grown is the White Pearmain, and the comparatively rough bark of this variety makes it difficult to get very satisfactory results from the lime-sulfur wash. The varieties of apple commonly grown in northern California—for example, Newton Pippin and Yellow Bellflower—are smooth barked, and better results with the wash are gained. Taking the State as a whole, Professor Woodworth says that it will be readily found in at least 25 per cent of the orchards, in injurious numbers in probably 10 per cent in any one year, and that from 25 per cent to 40 per cent of the orchards are sprayed with the lime, sulfur, and salt wash every year.

COLORADO.

The San Jose scale has apparently not yet obtained foothold in Colorado, but it has been sent to us from Colorado on fruit imported from California. The probable explanation is that the fruit regions of Colorado are above the climatic range of this scale insect.

CONNECTICUT.

The San Jose scale is recorded for at least five localities in Bulletin 12. The increase of this scale in Connecticut has been pretty rapid, and Mr. W. E. Britton, State entomologist, expresses the belief that there is now no town in the State which is not infested, tho he may not have records from quite all of the towns. It is found very generally, at any rate, in all of the larger cities, which are thoroly infested. Practically all of the larger orchards are infested, tho perhaps only slightly. He says that there are many orchards and trees which are still exempt, but that there is no general region of the State where the scale can not be found.

DELAWARE.

Delaware, as recorded in Bulletins 3 and 12, became generally infested very early. Mr. Wesley Webb, secretary of the State board of agriculture, now informs us that the San Jose scale occurs in all parts of Newcastle County and in approximately one-half of the orchards. In Kent County there are many young peach orchards, and more than one-half of them are infested to a greater or less extent, a large proportion of them, however, only slightly so. In the western half of Sussex County, along the railroad from Farmington to Delmar, nearly half of the orchards are somewhat infested, while in the eastern half of the county from Lincoln southward there are but few orchards, and these are comparatively free from scale.

DISTRICT OF COLUMBIA.

The occurrence of the San Jose scale in the District is reported in Bulletin 12, and it is now pretty generally distributed on fruit trees in the city of Washington and its suburbs.

FLORIDA.

The occurrence of the San Jose scale in Florida was brought to our attention in March, 1894, as recorded in Bulletin 3, and additional localities soon followed. Mr. E. W. Berger, assistant entomologist of the State experiment station, reports that the present distribution is extensive, the scale occurring in some twenty-odd counties, or wherever peaches are grown.

GEORGIA.

The early records of Georgia infestation beginning in 1894 are given in Bulletins 3 and 12. The San Jose scale in 1894 had a pretty strong foothold in this State. The recent conditions in Georgia are indicated on a map prepared by Mr. Newell and published in the proceedings of the Twenty-eighth Annual Meeting of the Georgia State Horticultural Society, in 1904. This map indicates very general infestation thruout the State, including most of the counties where fruit growing is of any importance. Prof. Hugh N. Starnes, in a letter transmitting this report, states that the large increase indicated on this map does not mean that infestation is still progressing, but merely that it has been more definitely located and the present State laws looking to the control of this pest are ample in their provisions and are being rigorously enforced. Mr. Newell reports in this connection that during 1904 out of a total of 218 nurseries inspected, only 9 were found infested, and that this is a very considerable reduction from the percentage of infestation shown by records of previous years.

IDAHO.

The infestation in this State is directly from western sources and is of long standing, at least in the limited area about Lewiston, where the oldest orchards are located. Mr. L. F. Henderson, the entomologist of the State experiment station, reports on the present situation under date of May 29 as follows:

in

The scale is very prevalent along the lower river bottoms, such as Lewiston on Clearwater, Juliaetta and Kendrick on Potlatch River (a tributary to Clearwater), up and down the Snake at Weiser, Payette, Caldwell, Nampa, as far as Glens Ferry, possibly farther. Its eastern limit *seems* about Mountain Home, as I do not know of it at Shoshone. It does [not?] exist on the upper Snake, as Blackfoot, nor in the extreme southeast, as Montpelier. The elevation of this district seems too high for it, as it varies from 4,000 to 7,000 feet altitude. The altitude seems also too high about

Moscow and Rathdrum, tho this altitude (2,500 feet) is not more than at Weiser and Boise. Possibly greater rainfall in these last districts discourages it. At any rate, while it has existed at Lewiston for fifteen years, it has not ascended to Genesee, 12 miles distant, but nearly 1,800 feet higher.

In many places it is being well controlled in the orchards, where careful and systematic spraying with lime-sulfur spray is done.

ILLINOIS.

The San Jose scale was located in Illinois in 1896 by Professor Forbes, who, at the end of the following year, had found the scale in 22 colonies in 11 counties, as reported in Bulletin 12 of this Bureau. In a recent letter Professor Forbes gives the details of the present infestation, which may be briefly summarized as follows: One-half of the counties (51 of the 102) of the State are now known to be more or less infested, but 43 per cent of the infested orchards are included in 2 of these counties and 80 per cent in 5 counties, and in 30 of the counties listed the average number of infested orchards is but $3\frac{1}{2}$. In four of the counties the infestation is found only in one or more towns and not in orchards. It will be seen from this statement that while the San Jose scale is pretty widely scattered thruout the State, as it is also in adjoining States, it is far from having gained a general foothold save in a few counties, and even in the worst counties infestation is not yet general. In no States has inspection and remedial work been carried out more thoroly than in Illinois, and this accounts for the rather favorable conditions, in view of the fact that probably nearly all of the infested orchards and districts have been located.

INDIANA.

The first case of infestation was brought to our attention in May, 1894, and subsequent records are indicated in Bulletins 3 and 12. As indicated in a map sent by Prof. J. Troop, horticulturist of the State experiment station, the scale is now distributed over the entire State, occurring, however, in less than half of the counties. It occurs in all the Ohio River counties, and Vanderburg is indicated as the one worst infested.

IOWA.

Iowa hitherto has been one of the western States supposedly free from the San Jose scale. The State entomologist, Mr. H. E. Summers, reports that he now knows of but one infested point in the State, confined to a single orchard in Louisa County. Some other cases of introduction of the scale were discovered a few years ago, but were treated in such a thoro way that reinspection during the last three years has shown no further development of scale. No San Jose scale has been found in any nursery in the State.

KANSAS.

Kansas has long belonged to a group of middle western States free from the San Jose scale. During the present year, however, this scale insect has been sent to us for determination from Dodge City on apple twigs, which is the first and only record so far for this State, on the authority of Prof. E. A. Popenoe, entomologist of the State experiment station. A general examination of the orchards of the State has been begun, however, and additional records will probably be discovered.

KENTUCKY.

But one record of the San Jose scale was known in Kentucky at the time of the publication of Bulletin 12. Professor Garman, State entomologist, now reports that the scale is still not generally distributed in the State, and the credit for this he believes is due to the prompt institution of nursery inspection shortly after the San Jose scale came into prominence in the East. Within the past four or five years, however, he reports an increase in the number of infested localities, particularly in northern counties, and is inclined to believe that in some cases the stock condemned on the other side of the river is brought over and distributed on the Kentucky side. The infestation is confined to the river counties and some half a dozen interior counties, all lying rather above the median line of the State.

LOUISIANA.

The early records of infestation in Louisiana are given in detail in Bulletin 3, and the scale is supposed to date in this State from about 1891, as there recorded. The present situation as given by Mr. Wilmon Newell, the entomologist of the State experiment stations, indicates 12 distinct localities of occurrence, ranging from the northern line of the State to New Orleans. These points are widely separated, and the State is comparatively free from the scale. Mr. Newell states that no very thoro inspection of all the orchard sections of the State has been made, but that from the work already done he believes that not over 5 per cent of the orchards, at the outside, are infested. But one small nursery is known to be infested, and the owner of this nursery is not permitted to place his stock on the market.

MAINE.

The San Jose scale has never been reported from Maine, and this is confirmed in a recent letter from Miss Edith M. Patch, the entomologist of the State experiment station.

MARYLAND.

Maryland early became one of the eastern States worst infested by the San Jose scale, and one that suffered most, perhaps, from this pest. It also received the most energetic early work in efforts at extermination and control. The present situation, as indicated by Mr. T. B. Symons, State entomologist, shows the San Jose scale to be generally distributed over the entire State, with the exception of the two extreme western counties, Garrett and Allegany, the former having the San Jose scale at 2 points and the latter at 15. By the method of employing State inspectors in the various counties, 1,500,000 trees of various kinds have been inspected each year for the past four years, and from the records thus gained 18 per cent of the fruit trees inspected are infested, and 65 per cent of the orchards, and this estimate is believed to be moderate.

MASSACHUSETTS.

The presence of the San Jose scale was determined in Massachusetts as early as April 25, 1895, as recorded in Bulletin 3. Additional records are given in Bulletin 12. Prof. H. T. Fernald, summing up the present situation, says that he was forced to give up the effort of keeping a complete list of localities known to be infested in 1900, finding that the scale was practically everywhere in Massachusetts east of the Connecticut River. At the present time it may be found in almost every town to the western boundary of the Connecticut Valley, say 15 miles west of the river on the average. In Berkshire County, which lies west of this, he has no records, but he would not be surprised to find it somewhere in that region, particularly along the Housatonic Valley. As to percentage of infestation, he says that about one-third of the orchards are infested to a greater or less degree, and the infested orchards are particularly the more recently planted ones. In the older orchards infested replants may occasionally be found. Many of the cases of infestation, however, are of ornamental trees and shrubs in house lots. He states that from such places as the Arnold Arboretum and the Metropolitan Park system around Boston, which have had the scale for nearly fifteen years, it has spread in all directions, and that in Massachusetts it is less an orchard problem than one of ornamental plants.

MICHIGAN.

Michigan was not known to be infested at the time of the publication of Bulletin 3, but Professor Barrows, in August, 1897, reported 14 localities in 10 counties, the evidence showing that the scale had been present in the State since 1890. The present situation is indicated on a map prepared by the entomologist of the State experiment

station, Mr. R. H. Pettit, with the assistance of Professor Taft, and shows scattering infestation thruout the southern third of the State, the points farthest north in the interior away from the influence of Lake Michigan being at Ithaca and Otter Lake, which are both rather beyond the anticipated range of the scale insect. It is not shown, however, that the extreme points in the range are points of permanent infestation.

MINNESOTA.

The San Jose scale has not been reported from Minnesota.

MISSISSIPPI.

Mississippi apparently became infested with the San Jose scale at the same time (1891) and from the same material which carried this pest to Louisiana. Mr. Glenn W. Herrick, professor of biology, Agricultural College, Miss., now reports the scale from 16 localities in 15 counties. It is probable, however, that in portions of Mississippi and Louisiana the San Jose scale will not become nearly as serious a pest as in northern localities, on account of the action of fungous diseases.

MISSOURI.

The occurrence of the San Jose scale in 16 localities, as reported by Professor Stedman, is noted in Bulletin 12. Mr. Stedman now states that the San Jose scale has practically overrun the whole of St. Louis County, and that there is a bad case of infestation south of Independence, another just west of Cape Girardeau, and one near Charleston.

MONTANA.

The San Jose scale has never been reported from Montana. Mr. R. A. Cooley, the State entomologist, reports that during his seven years in Montana he has been in touch with all parts of the State, and feels sure that if the San Jose scale occurred there he would have known of it. A few reported cases investigated have turned out to be of other species.

NEBRASKA.

The San Jose scale has so far not been found in Nebraska, as reported by Prof. Lawrence Bruner, "except on fruit that has been shipped in, principally from Colorado." In view of its nonoccurrence in Colorado, the fruit referred to must have come from California or elsewhere.

NEW HAMPSHIRE.

It was early hoped that the San Jose scale would not be able to infest much of the fruit regions of New England, but this hope seems to be diminishing, and Prof. Clarence M. Weed reports the San Jose scale as far north as the White Mountain region in New Hampshire,

to an extent that it is seriously destructive. The records of infestation show the occurrence of this insect in New Hampshire in the eastern part of Manchester, in Dover Point, and Intervale, and in nurseries at Dover, Epping, and Seabrook; also in trees from these nurseries at Rollinsford, Lee, and Durham. Mr. E. D. Sanderson, the present entomologist of the State experiment station, adds two additional localities, one in Newington and the other at North Danville. Mr. Sanderson reports that no orchard inspections have been made, and that as practically all of the nursery stock comes originally from outside of the State, many of the younger orchards are probably infested.

NEW JERSEY.

New Jersey, responsible for much of the original distribution of the San Jose scale in the East, early became generally infested, as recorded in Bulletins 3 and 12. Dr. J. B. Smith, State entomologist, reports that this scale now occurs thruout the State and probably in 90 per cent of the orchards. In a general way, he says, those districts that are longest infested are in a better condition than those that have become more recently infested, because growers in the first instance have learned how to deal with the insect to the best advantage.

NEVADA.

The occurrence of the San Jose scale in Nevada is noted in Bulletin 12 in gardens in the city of Reno. We have records also from Carson City dating from 1903 and 1904. Prof. J. E. Stubbs, director of the State experiment station, writes that the insect is fairly under control in the State. In 1904, he says, and prior to that time, its ravages in three or four counties were considerable, and farmers complained that they were losing their fruit on account of it. At the session of the legislature held in 1903 a law was past giving authority to the several counties to appoint an inspector of trees, especially fruit trees. In Washoe, Ormsby, Humboldt, Elko, and Lincoln counties these inspectors are said to have done pretty good work and to have checked the scale by spraying; especially was this true in the counties of Washoe and Ormsby.

NEW MEXICO.

The distribution of the San Jose scale in New Mexico has probably changed very little since the publication of Bulletins 3 and 12, and no late records have been received from this Territory.

NEW YORK.

The presence of the scale in New York was determined in August, 1894, and the early records are noted in Bulletins 3 and 12. The present condition of this scale insect in New York has been reported to

us by Messrs. M. V. Slingerland and E. P. Felt. Mr. Slingerland gives a long list of the infested localities received at the Cornell experiment station, and reports that in general Long Island, the Hudson River Valley, and Niagara County seem to be the worst-infested sections. Mr. Felt's records were made after consultation with Mr. Atwood, of the State department of agriculture, who has direct charge of nursery-inspection work. The following counties are reported as badly infested, either because of the pest being generally distributed thruout the entire county or else because of its inflicting considerable damage in certain restricted areas: Albany, Cayuga, Chemung, Columbia, Dutchess, Erie, Kings, Nassau, Niagara, Ontario, Orleans, Putnam, Queens, Rensselaer, Richmond, Rockland, Suffolk, Wayne, Westchester, and Yates. It is also known to occur in the following counties: Broome, Chautauqua, Delaware, Fulton, Greene, Jefferson, Madison, Monroe, New York, Oneida, Orange, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Tompkins, Ulster, and Washington. Mr. Felt reports that the scale may be safely said to be present in most sections where fruit interests are at all extensive, tho not always generally distributed.

NORTH CAROLINA.

The first records of the occurrence of the San Jose scale in North Carolina are given in Bulletin 12. Mr. R. S. Woglum, acting entomologist of the North Carolina department of agriculture, has submitted a map indicating general infestation thruout the State, represented by over fifty counties, in which the number of points infested range from 1 to 42. These points are definitely known either from personal observation or else from the receipt of specimens on plants. West of the Blue Ridge Mountains the region is quite free from the scale, only four infested localities being known.

NORTH DAKOTA.

No San Jose scale.

OHIO.

The early conditions in Ohio, as determined by Prof. F. M. Webster, are reported in Bulletins 3 and 12. Mr. A. F. Burgess, chief State inspector, gives the following summary of the present conditions:

Counties having no infested orchards	26
Counties with 1 infested orchard locality	27
Counties with 2 infested orchard localities	10
Counties with 3 infested orchard localities	10
Counties with more than 3 infested orchard localities or having large infested areas or numerous small outbreaks	15

The majority of the larger cities of the State are more or less infested.

These points of infestation cover the State pretty generally.

OKLAHOMA.

The first records of the San Jose scale in Oklahoma were received in 1904, on Japan plum from Mulhall. We have since received it, in 1905, on peach from Stillwater and El Reno. Mr. J. F. Nicholson, entomologist of the agricultural experiment station, reports that the scale has been found to a limited extent in five places in the Territory, namely, Mulhall, Shawnee, El Reno, Wellston, and Chandler. All of these cases are trees in city gardens.

OREGON.

Mr. A. B. Cordley, referring to present conditions in Oregon, states that to enumerate the localities where the San Jose scale is found would be practically to include all places where fruit is grown. He says that it occurs in a very large proportion of the orchards in western Oregon, from Ashland to Portland, particularly those along the lines of railroads or in the vicinity of towns, there being scattered orchards back toward the foothills which the San Jose scale has not yet reached. It occurs also between Portland and Astoria, along the Columbia River; is present in the Hood River Valley; in the Walla Walla Valley in the vicinity of Milton and Freewater, and in the Grande Ronde Valley in the vicinity of Vale and Ontario. There are, however, large areas of central and southern Oregon, remote from the railroads, where little fruit is grown, that the scale has not yet reached. It is noted, however, that the scale does no great injury except in small farm orchards or those that are neglected, and that in all the large orchards the lime, sulfur, and salt mixture as a winter spray is in general use.

PENNSYLVANIA.

The San Jose scale became early established in Pennsylvania from New Jersey nurseries, but the subject of San Jose scale control was not taken up as early in this State as in neighboring States, so that the conditions at the outset were not well known. Both Prof. H. A. Surface, economic zoologist of the State, and Mr. George C. Butz, the horticulturist of the agricultural experiment station, agree in the statement that the San Jose scale is now so widespread in Pennsylvania that there is scarcely a county that has not points of infestation. It occurs in practically all the important fruit regions of the State, and in many private and public grounds, especially in the portion of Pennsylvania lying east of the Allegheny Mountains. Mr. Butz reports that probably 20 per cent of the orchards are more or less infested. Professor Surface has, with the assistance of 30 inspectors, taken up active warfare against the scale, inspecting orchards and nurseries and trees in parks and giving demonstrations in methods of suppressing it. He states that he has not found the scale in the three northeastern

counties of the State, nor in some of the counties northwest of the center of the State, such as Cameron, Elk, Forest, McKean, and Warren.

RHODE ISLAND.

No records from Rhode Island had been received up to the time of the publication of Bulletin 12, in 1898, but Mr. A. E. Stene, of the College of Agriculture and Mechanic Arts, states that the scale has now spread over almost the entire State, and nearly every orchard where planting has been done in the last ten years is more or less infested. There are a few old orchards where no new trees have recently been set that are still free from the scale. It is believed that four-fifths of the orchards in the State are infested.

SOUTH CAROLINA.

But a single record for South Carolina had been received up to the time of the publication of Bulletin 12, largely, as there indicated, for the reason that there had been no State entomologist, and no work of inspection had been done. The records which have come to this office from South Carolina now number 10, and represent 7 different localities distributed miscellaneously over the State. Naturally, very few of the actual records would come to us, and the indications are that the State is pretty generally infested. Mr. C. E. Chambliss, the entomologist of the experiment station, now reports 24 infested localities, all of which had the scale prior to 1900.

SOUTH DAKOTA.

No San Jose scale has yet been reported from South Dakota. Mr. W. A. Wheeler, the entomologist of the experiment station, states that he has inspected nurseries of South Dakota for two years, and has not found the San Jose scale in any nursery. It has been introduced with stock received by the college from other States, but has always been speedily disposed of when received, and so far is not known to infest any of the orchards.

TENNESSEE.

A single locality was recorded for the San Jose scale in the eastern portion of the State in Bulletin 12. Since that time the number of records for the San Jose scale which have come to this office for determination has increased to 14. These are distributed generally over the State, and indicate rather widespread infestation, and naturally very much more than is shown by the material which has been sent to the Department.

A recent letter from Mr. G. M. Bentley, assistant entomologist, gives the information that no complete survey of the State has been

made, but, roughly speaking, 30 per cent of the nurseries are more or less infested, and in eastern Tennessee the San Jose scale is very generally present; but the section of the State, notably Franklin County, where most of the nurseries are located, is free from the pest. The extreme western part of the State, in the Memphis section, is also pretty badly infested. No general orchard inspection of the State has been made.

TEXAS.

Eight localities were reported for Texas in Bulletin 12. The scale is now fairly widely distributed in the State, the records of this office numbering 19, some of these, however, representing the same district. The localities cover, generally speaking, the eastern half of the State, namely, the nonarid portion where fruit growing is followed to a greater or less extent. Prof. A. F. Conradi, the State entomologist, has records of the insect's occurrence in Bexar, Brazoria, Calhoun, Cherokee, Comal, Comanche, Eastland, Erath, Galveston, Harris, Harrison, Hopkins, Hunt, Valverde, Wharton, and Wood counties.

UTAH.

No San Jose scale was recorded for Utah in either Bulletin 3 or 12. In 1899 it was sent to us for determination from both Ogden and Logan. Mr. E. D. Ball, the entomologist of the State experiment station, reports that he is unable to give the exact localities of the occurrence of this insect, but states that it is pretty widely spread in the central section of the State, doing, however, little damage. It seems to be controlled by the twice-stabbed ladybird. The commercial orchards, as a rule, are practically free. A good deal of spraying has been done with the standard lime-sulfur wash.

VERMONT.

The occurrence of the San Jose scale in Vermont was brought to our notice in 1899. Mr. William Stuart, horticulturist of the State experiment station, says that it is now known to occur in only two localities, namely, Charlotte, Chittenden County, and Orwell, Rutland County; in both instances occurring in only one orchard.

VIRGINIA.

The details of the early records in Virginia are given in Bulletin 3 and in Bulletin 12. A great many new records have been received from Virginia and more material has come to this Bureau for determination from Virginia than from any other State except Pennsylvania. Mr. J. L. Phillips, State entomologist, in reply to our circular letter refers

to his publications, in which it appears that the San Jose scale is recorded from 78 counties. Many orchards in all of the counties are still free from the scale, but infestation is very general thruout the State.

WASHINGTON.

The State of Washington was early infested with the San Jose scale from California, and at the time of the publication of Bulletin 3, in 1896, the fruit-growing regions were pretty well dotted with this pest. Mr. A. L. Melander, assistant entomologist, submits a map which is about to be published in a bulletin showing the distribution of this insect. It indicates the occurrence of the scale in the western settled section of the State, where fruit growing is important, following the river valleys, but with some important scattering districts on the west side of the mountains, where it seems to have a precarious foothold. It is little dreaded by orchardists, and fruit trees are commonly sprayed with the lime, sulfur, and salt wash in February, and one treatment is reported to be effective for several years.

WISCONSIN.

Wisconsin is, on the authority of Mr. E. P. Sandsten, horticulturist of the State experiment station, now free from the San Jose scale. The only occurrence of this pest in the State was three years ago, in the extreme southern part, and it was here stamped out by the prompt adoption of radical measures.

WYOMING.

Mr. B. C. Buffum, director of the agricultural experiment station, reports that the San Jose scale has not yet appeared in Wyoming. There are but few orchards in bearing, and these are believed to be free from this pest.

WEST VIRGINIA.

The San Jose scale was first noticed in West Virginia in 1896. Many examples of the San Jose scale in this State have been sent to this office for determination, showing the scale to be very generally distributed.

The recent reports of the West Virginia experiment station, notably those for 1903-4 and 1904-5, and later records received from the entomologist of the experiment station, Mr. W. E. Rumsey, indicate very general infestation thruout the State, conditions being similar to those in Virginia. Nevertheless, while there are hundreds of infested orchards and several infested nurseries, the great mass of the orchards and nurseries are still free from scale. A very careful nursery and orchard inspection is maintained in West Virginia, and

the actual conditions of infestation are perhaps as well known in this State as in any other. In many localities the scale is held in check by this careful system of inspection and by the prompt and thorough adoption of the remedial treatment.

CANADA.

On the authority of Dr. James Fletcher, the Dominion entomologist, the San Jose scale infestation in the eastern portion of Canada is confined to the Niagara Peninsula and counties along the north shore of the west end of Lake Erie. It has also been found in several localities in British Columbia, having reached this province in its northward migration along the Pacific slope.

THE RELATION OF CLIMATE TO SPREAD.

This subject was rather carefully considered in both Bulletins 3 and 12, in connection with the climatic districts or life zones established by Dr. C. Hart Merriam, within which particular animals thrive and outside of which they fail to establish themselves. These life zones as thus limited have a special value in indicating the probable spread of many injurious insects, and seem to be particularly significant in the case of the San Jose scale. These life zones are: The tropical, occupying small areas in Florida and southern Texas; the lower and upper austral, covering the bulk of the United States; and the transition zone, coming between the last and the boreal zone of Canada northward. These zones will be better understood by reference to the accompanying map (Pl. V). The early records led to the belief that the San Jose scale would be practically limited to the upper and lower austral zones, and that the important fruit districts in the northern United States and in elevated mountain regions, represented by the transition zone, would be slightly if any infested. In the main, the records of the distribution of the San Jose scale have confirmed this belief. Nevertheless, the scale has, in a number of instances, appeared well into the transition zone as fixed by Doctor Merriam, notably in Massachusetts, in New York, in Michigan, and a few other points; but in most of these cases the evidence gained from the relation of other animals and plants would indicate that the transition and upper austral zones were not correctly charted, so that in general the belief in the immunity of the transition zone holds.

As pointed out by Doctor Howard in Bulletin 12, the coastal law which brings about the intermingling of northern and southern forms will probably justify the eastern Massachusetts occurrences. Other occurrences in Massachusetts are justified by the river-valley law in relation to the Connecticut River, and Doctor Merriam admits that his line across the southern peninsula of Michigan is not very accurately

drawn. Special topographical conditions and protecting mountains will probably account for other divergences.

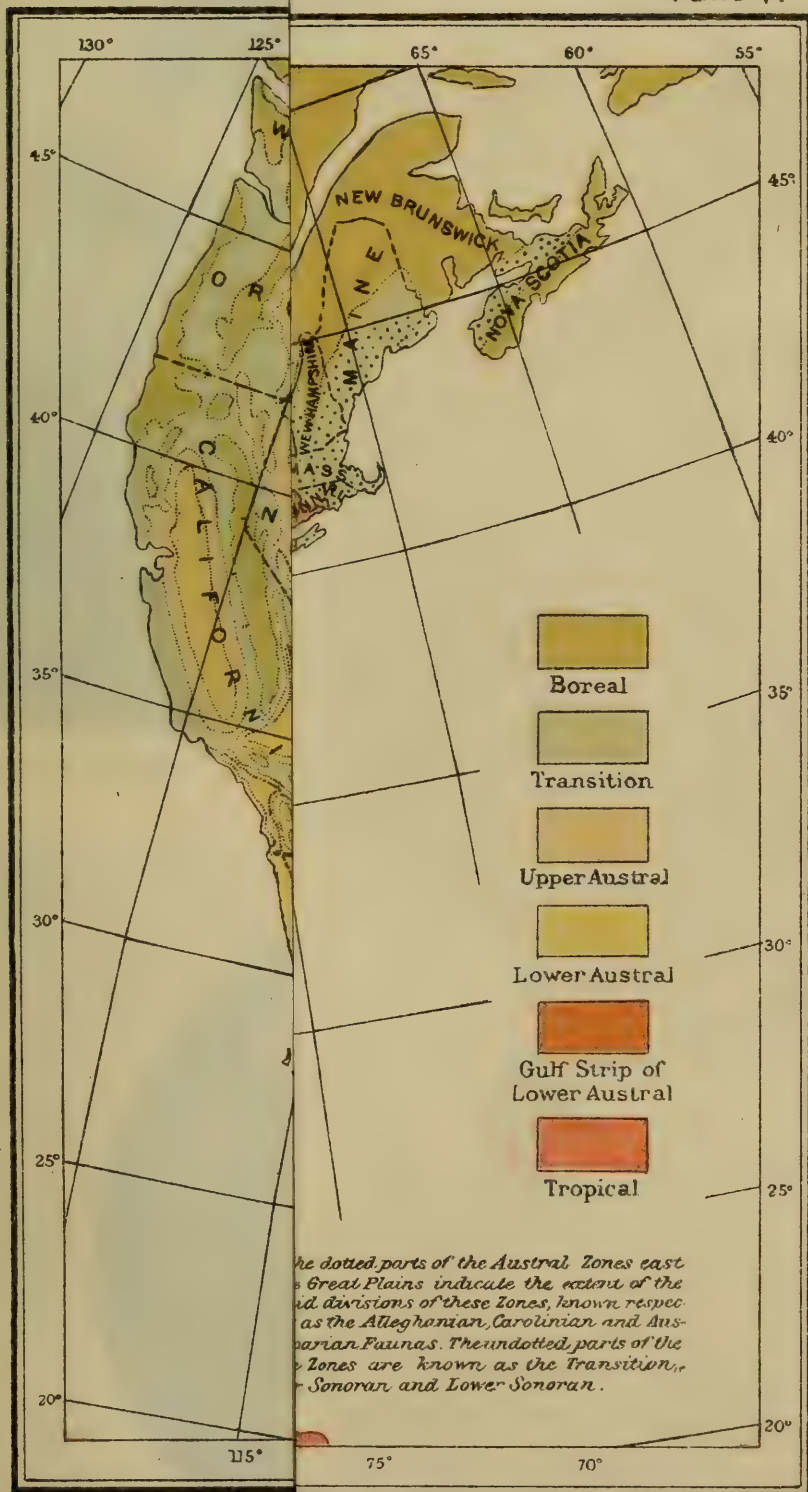
In the lower austral and tropical regions the San Jose scale, as pointed out by Doctor Howard, may not prove as injurious as in the upper austral, and this follows the general rule regarding armored scale insects in warm countries. Armored scales rarely appear or thrive in the moist Tropics, as shown by the explorations of the writer in the East and West Indies. Fungous diseases, which thrive in warm and moist climates, are the principal agency in keeping such scale insects in check, and in the case of the San Jose scale the common scale fungus *Sphaerostilbe coccophila* has already done good work in Florida and other portions of the lower austral zone. Moisture is a prerequisite in the case of this disease, and little benefit comes from it in the drier portions of this zone. Too much stress, however, should not be put on zonal limitations, and there may always be outbreaks of longer or shorter standing in the borders of the transition region.

HABITS AND LIFE HISTORY.

NATURE OF THE DAMAGE.

The San Jose scale, as already stated, occurs on all parts of the plant—limbs (Pl. I; Pl. VI, fig. 1), leaves, and fruit (Pl. VI, fig. 2). As the plant becomes badly infested the scales lie very close together on the limbs, frequently overlapping, sometimes with several young ones clustering over the surface of an old mature scale. The general appearance which they present is of a grayish, very slightly roughened, scurfy deposit. The natural rich reddish color of the young limbs of peach, pear, and apple is quite obscured when these trees are thickly infested, and they have then every appearance of being coated with ashes. When the scales are crushed by scraping, a yellowish, oily liquid will appear, resulting from the mashing of the soft, yellow insects beneath the scales. Examined under a hand lens during the summer, numbers of the little orange-colored larvæ will be seen running about, and the snowy white young scales will be interspersed with the old brown or blackened mature scales. The appearance presented at this time under the lens is shown in fig. 2. Very frequently the scale has a marked tendency to infest the extremities of the branches and twigs. This is particularly noticeable with pear. As usually found on peach, the scale is massed often more densely on the older growth, and works out more slowly toward the new wood.

The leaves are much less apt to bear scales, but in severe cases the upper surface particularly becomes infested, the scales frequently ranging in two or more quite regular rows on either side of the midrib.



Corrected to December

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.



Corrected to December, 1897

LIFE ZONES OF THE UNITED STATES

BY
C. HART MERRIAM

ANDREW S. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.



FIG. 1.—LARGE APPLE TREES WITH LOWER LIMBS KILLED BY THE SAN JOSE SCALE, YOUNGSTOWN, N. Y. (ORIGINAL.)

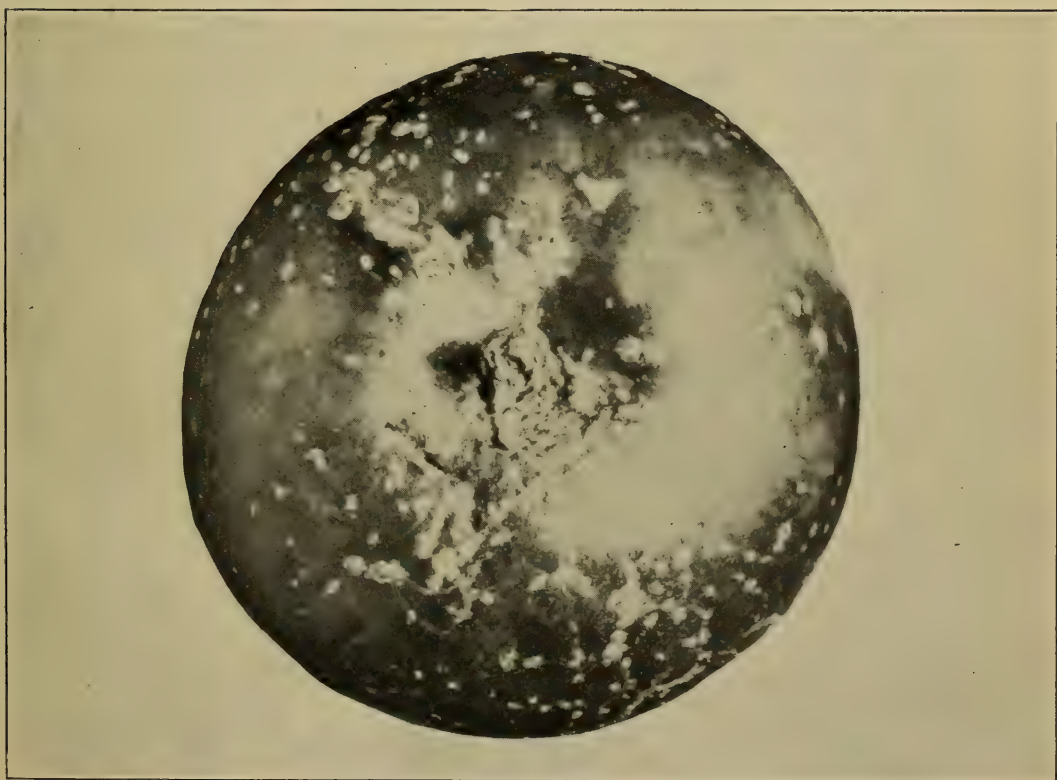


FIG. 2.—APPLE INFESTED WITH SAN JOSE SCALE. SLIGHTLY ENLARGED (ORIGINAL).

The male scales are more numerous on the leaves than the females. The infested leaves turn purplish brown.

The San Jose scale was formerly supposed to differ from all others in the peculiar reddening effect which it produces upon the skin of the fruit and of tender twigs. This, however, sometimes occurs with other scales, but is a particularly characteristic feature of this insect, and renders it easy to distinguish. The encircling band of reddish discoloration around the margin of each female scale is very noticeable

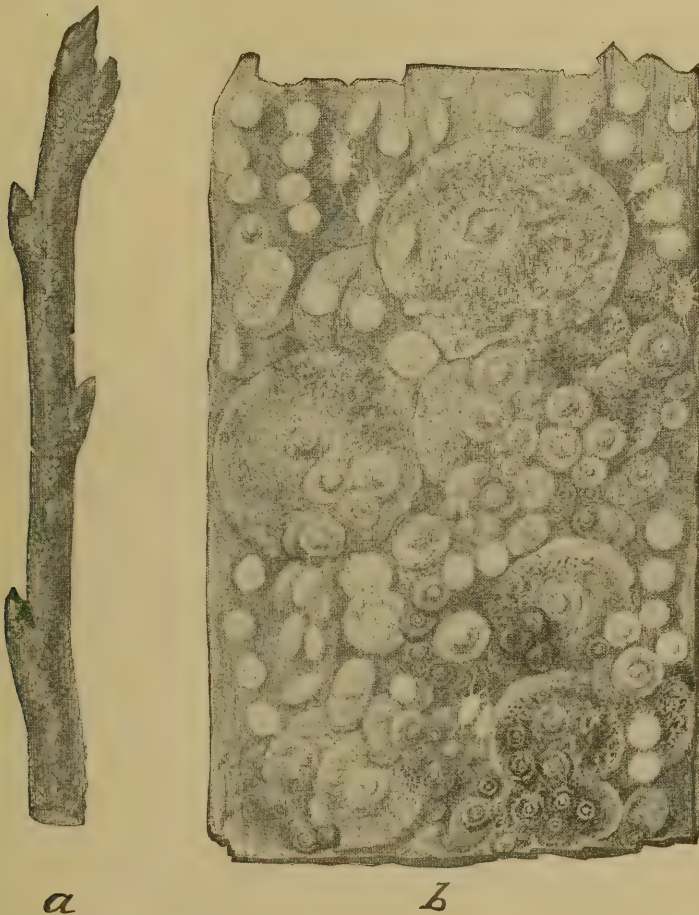


FIG. 2.—Appearance of San Jose scale (*Aspidiotus perniciosus*) on bark: *a*, infested twig, natural size; *b*, bark as it appears under hand lens, showing scales in various stages of development and young larvæ. (From Howard and Marlatt.)

on fruit, especially pears. This appearance, however, sometimes so closely resembles the small spots on fruit produced by a common fungus, *Entomosporium maculatum* Lev., as to require close examination with a lens to distinguish it. Fruit severely attacked becomes distorted, rough, and pitted, frequently cracking, and may eventually fall prematurely or at least become unmarketable.

The cambium layer of young twigs where the scales are massed together is usually stained deep red or purplish, and when the scale is only scatteringly present the distinctive purplish ring surrounding each

is almost as noticeable on young twigs as on fruit, and is of the greatest service in facilitating the inspection of trees which have been subject to possible contagion. The almost microscopic young scale might easily elude the most careful search, but the striking circling ring makes it a comparatively conspicuous object without the aid of a glass.

If the tree survives the attack the infested wood eventually becomes knotty and irregular, partly from the sapping of the juices by the insect and also without doubt largely from the poisoning of the sap of the cambium layer by the punctures of the insect, as indicated by the discoloration. Young peach trees will ordinarily survive the scale only two or three years. Pears are sometimes killed outright, but generally maintain a feeble, sickly existence, making little or no growth for a somewhat longer period.

FOOD PLANTS.

The San Jose scale may attack almost any deciduous plant, including fruits, ornamentals, and the various shade trees. Food-plant lists were published in Bulletins 3 and 12 of this Bureau, and several subsequent writers have given lists, with important additions. The most careful investigation of the subject, relating particularly to ornamental trees and shrubs, but also to fruit trees, as these are often planted for ornament, was that conducted by the State entomologist of Connecticut, Mr. W. E. Britton, who sent out a circular letter to the entomologists and horticultural inspectors of the various States asking for data under three headings, namely: (1) Plants commonly infested; (2) those occasionally or rarely infested; (3) those not infested. Forty-five replies were received, and from these and other records his list was prepared. This list I have reproduced, together with his following explanatory paragraphs.^a

LIST OF HARDY TREES, SHRUBS, AND VINES.

COMMONLY OR BADLY INFESTED.

- Acacia* sp. Lintner, Felt, N. Y.; Alwood, Va.
Akebia sp. Felt, N. Y.
Akebia quinata Decaisne. Alwood, Va.
Amelanchier canadensis Medic., and other species. Shad-bush, Juneberry. Britton, Koehler, Conn.; Alwood, Va.
Citrus trifoliata Linn. Scott, Ga.; Alwood, Va.; Gossard, Fla.
Cornus alba Linn. var. *sibirica* Lodd. Britton, Conn.
Cornus baileyi Coult & Evans. Gould (in N. Y.).
Cornus sanguinea Linn. Britton, Conn.
Cotoneaster sp.? Britton, Conn.; Lintner, Felt, N. Y.; Card, R. I.
Cotoneaster vulgaris Lindl. Alwood, Va.

^a Report of the Connecticut Agricultural Experiment Station, 1902, Part II, 2d Report of the Entomologist, pp. 132-138.

- Crataegus* sp. Hawthorn. Britton, Conn.; Lintner, Felt, N. Y.; Alwood, Va.; Smith, N. J.
- Crataegus cordata* Soland. Koehler, Conn.
- Crataegus oxyacantha* Linn. English hawthorn. Britton, Koehler, Conn.
- Crataegus coccinea* Linn. Koehler, Conn.
- Crataegus crus-galli* Linn. Koehler, Conn.
- Cydonia vulgaris* Pers. Common quince. Britton, Conn.; Lintner, N. Y.; Alwood, Va.
- Cydonia japonica* Pers. Japanese or flowering quince. Britton, Koehler, Conn.; Lintner, N. Y.; Alwood, Va.; Johnson, Md.
- Fagus sylvatica* Linn. var. *purpurea* Ait. European purple-leaved beech. Smith, N. J.
- Juglans sieboldiana* Maxim. Japanese walnut. Britton, Conn.; Alwood, Va.; Sherman, N. C.; Smith, N. J.
- Ligustrum vulgare* Linn. Common privet. Alwood, Va.
- Populus* sp. Poplar. Britton, Conn.; Smith, N. J.; Sanderson, Del.; Felt, N. Y.
- Populus deltoides* Marsh. Carolina poplar. Britton, Conn.; Rolfs & Quaintance, Fla.; Alwood, Va.
- Populus nigra* Linn. var. *italica* Du Roi. Lombardy poplar. Britton, Koehler, Conn.; Rolfs & Quaintance, Fla.; Alwood, Va.
- Prunus amygdalus* Stokes. Almond. Lintner, N. Y.; Alwood, Va.
- Prunus armeniaca* Linn. Apricot. Lintner, Felt, N. Y.; Alwood, Va.; Smith, N. J.
- Prunus avium* Linn. Sweet cherry. Britton, Conn.; Lintner, Felt, N. Y.; Alwood, Va.; Smith, N. J.; Cockerell, N. Mex.
- Prunus pumila* Linn. Koehler, Conn.
- Prunus pumila* var. *besseyi* Waugh. Sand cherry. Alwood, Va.
- Prunus cerasifera* Ehrh., var. *atropurpurea* Dipp. (*P. pissardi*). Purple-leaved plum. Britton, Conn.; Felt, N. Y.
- Prunus domestica* Linn. European plum. Britton, Conn.; Alwood, Va.
- Prunus hortulana* Bailey. Wild goose plum. Alwood, Va.
- Prunus japonica* Thunb. Flowering almond. Britton, Conn.; Felt, N. Y.
- Prunus maritima* Waugh. Beach plum. Koehler, Britton, Conn.
- Prunus persica* Sieb. & Zucc. Peach. Britton, Koehler, Conn.; Lintner, Felt, N. Y.; Alwood, Va.; Cockerell, N. Mex.
- Prunus triflora* Roxbg. Japanese plum. Britton, Koehler, Conn.; Alwood, Va.
- Prunus serotina* Ehrh. Koehler, Conn.
- Prunus virginiana* Linn. Chokecherry. Koehler, Conn.
- Ptelea trifoliata* Linn. Hop tree. Fernald, Mass.
- Pyrus communis* Linn. Pear. Britton, Koehler, Conn.; Lintner, Felt, N. Y.; Alwood, Va.; Cockerell, N. Mex.
- Pyrus sinensis* Lindl. Sand pear, including Kieffer. Alwood, Va.
- Pyrus baccata* Linn. Koehler, Conn.
- Pyrus malus* Linn. Apple. Britton, Koehler, Conn.; Lintner, Felt, N. Y.; Alwood, Va.; Doten, Nev.; Cockerell, N. Mex.
- Pyrus* sp. Crab apple. Britton, Conn.
- Ribes oxyacanthoides* Linn. Gooseberry. Britton, Conn.; Lintner, Felt, N. Y.; Alwood, Va.; Troop, Ind.
- Ribes aureum* Pursh. Missouri or flowering currant. Lintner, N. Y.
- Ribes rubrum* Linn. Currant. Britton, Conn.; Lintner, Felt, N. Y.
- Ribes nigrum* Linn. Black currant. Alwood, Va.
- Rosa* sp. Britton, Conn.; Lintner, N. Y.; Alwood, Va.; Cockerell, N. Mex.; Burgess, Ohio; Troop, Ind.; Gould, Md.; Scott, Ga.
- Rosa carolina* Linn. Koehler, Conn.
- Rosa lucida* Ehrh. Koehler, Conn.

- Rosa virginiana* Mill. Koehler, Conn.
Rosa rugosa Thunb. Britton, Koehler, Conn.
Salix sp. Willow. Britton, Conn.; Felt, N. Y.; Sanderson, Del.
Salix lucida Muhl. Koehler, Conn.
Salix pentandra Linn. Laurel-leaved willow. Lintner, N. Y.; Alwood, Va.
Salix vitellina Linn. Koehler, Conn.
Salix babylonica Linn. Weeping willow. Lintner, N. Y.; Alwood, Va.
Salix humilis Marsh. Koehler, Conn.
Salix incana Schrank. Koehler, Conn.
Sorbus sp. Mountain ash. Felt, N. Y.; Hunter, Kans.
Sorbus americana Marsh. American mountain ash. Britton, Koehler, Conn.; Alwood, Va.
Sorbus aucuparia Linn. European mountain ash. Britton, Koehler, Conn.
Sorbus melanocarpa C. Koch. (*Aronia nigra* Koehne). Black chokeberry. Koehler, Conn.
Symphoricarpos racemosus Michx. Snowberry. Felt, N. Y.; Smith, N. J.
Syringa vulgaris Linn. Common lilac. Burgess, Ohio; commissioner of agriculture, N. Y.; Troop, Ind.; Alwood, Va.
Syringa persica Linn. Persian lilac. Britton, Conn.
Tilia sp. Basswood, linden. Britton, Conn.; Lintner, commissioner of agriculture, N. Y.
Tilia americana Linn. American linden or basswood. Britton, Conn.; Alwood, Va.
Toxylon pomiferum Raf. Osage orange. Britton, Conn.; Lintner, Felt, N. Y.; Alwood, Va.
Ulmus sp. Elm. Lintner, N. Y.; Webster, Ohio; Troop, Ind.
Ulmus americana Linn. American elm. Britton, Koehler, Conn.; Alwood, Va.
Ulmus campestris Smith. English or European elm. Britton, Conn.; Felt, N. Y.; Smith, N. J.

OCCASIONALLY OR RARELY INFESTED.

- Acer* sp. Maple. Webster, Burgess, Ohio; Fernald, Mass.; Butz, Pa.; commissioner of agriculture, N. Y.
Acer saccharinum Linn. Silver maple. Gould, Md.; Alwood, Va.; Hunter, Kans.; Felt, N. Y.
Acer saccharinum. Weir's cut-leaved. Felt, N. Y.
Acer platanoides Linn. Norway maple. Gould, Md.
Actinidia arguta Miq. (*A. polygama*). Alwood, Va.
Asculus hippocastanum Linn. Horse-chestnut. Felt, commissioner of agriculture, N. Y.; Burgess, Parrot, Green, Ohio.
Alnus sp. Alder. Felt, N. Y.; Alwood, Va.
Ampelopsis quinquefolia Michx. Virginia creeper. Alwood, Va.
Betula sp. Birch. Felt, N. Y.
Betula alba Linn. Cut-leaved white birch. Britton, Conn.; Rolfs & Quaintance, Fla.
Buxus sp. Box. Britton, Conn.
Castanea americana Raf. Chestnut. Rolfs & Quaintance, Fla.; Alwood, Va.; Felt, N. Y.
Catalpa sp. Rolfs & Quaintance, Fla.
Catalpa bignonioides Walt. Common catalpa. Alwood, Va.
Ceanothus americanus Linn. Koehler, Conn.
Celtis occidentalis Linn. Koehler, Conn.
Cercidiphyllum japonicum Sieb. & Zucc. Britton, Conn.
Citrus aurantium Linn. Gossard, Fla.
Cornus alternifolia Linn. Koehler, Conn.
Cornus stolonifera Michx. Koehler, Conn.

- Cornus circinata* L'Hérit. Koehler, Conn.
Cornus amomum Mill. Koehler, Conn.
Cornus candidissima Marsh. Koehler, Conn.
Cornus florida Linn. Commissioner of agriculture, Felt, N. Y.; Britton, Conn.
Cornus florida. Red flowering. Alwood, Va.
Deutzia sp. Fernald, Mass.
Diospyros virginiana Linn. Persimmon. Lintner, N. Y.
Elaeagnus sp. Felt, N. Y.
Elaeagnus longipes Gray. Silver thorn. Commissioner of agriculture, N. Y.; Scott, Ga.
Eucalyptus sp. Felt, N. Y.
Euonymus sp. Lintner, N. Y.; Alwood, Va.
Ficus carica Linn. Fig. Felt, N. Y.
Forsythia sp. Commissioner of agriculture, N. Y.
Fraxinus sp. Ash. Felt, N. Y.; Butz, Pa.
Fraxinus americana Linn. White ash. Hunter, Kans.
Gleditschia triacanthos Linn. Honey locust. Britton, Conn.; Sanderson, Del.; commissioner of agriculture, N. Y.; Johnson, Md.
Hibiscus syriacus Linn. Shrubby althea. Smith, N. J.
Hicoria pecan Britt. Pecan nut. Lintner, N. Y.; Alwood, Va.; Scott, Ga.
Juglans nigra Linn. Black walnut. Alwood, Va.; Rolfs & Quaintance, Fla.
Juglans regia Linn. Persian or English walnut. Alwood, Va.; Lintner, Felt, N. Y.; Sanderson, Md.
Kalmia latifolia Linn. Mountain laurel. Felt, N. Y.
Kerria-japonica DC. Globe flower. Japanese rose. Felt, N. Y.
Ligustrum ovalifolium Hassk. California privet. Britton, Koehler, Conn.
Lonicera sp. Honeysuckle. Felt, N. Y.
Morus sp. Mulberry. Alwood, Va.; Burgess, Ohio; Johnson, Md.; Scott, Ga.
Morus sp. Tea's weeping mulberry. Taft, Mich.
Physocarpus opulifolius Maxim. Koehler, Conn.
Picea alba Link. White spruce. Fernald, Mass.
Prunus cerasus Linn. Sour cherry. Felt, N. Y.; Alwood, Va.; Burgess, Ohio.
Photinia villosa DC. Koehler, Conn.
Rhodotypos kerrioides Sieb. & Zucc. Koehler, Conn.
Rhus sp. Sumac. Rolfs & Quaintance, Fla.; Alwood, Va.; Felt, N. Y.
Rhus cotinus Linn. Smoke bush. Commissioner of agriculture, N. Y.
Robinia sp. Locust. Sanderson, Del.; Burgess, Webster, Ohio; Johnson, Md.
Rubus strigosus Michx. Red raspberry. Alwood, Va.; Lintner, Felt, N. Y.; Johnson, Md.
Rubus nigrobaccus Bailey (*R. villosus*). Common blackberry. Lintner, Felt, N. Y.; Johnson, Md.
Rubus villosus Ait. (*R. Canadensis*). Dewberry. Felt, N. Y.
Sambucus sp. Elder. Commissioner of agriculture, N. Y.; Fernald, Mass.; Webster, Ohio.
Sassafras officinale Nees. Sassafras. Sanderson, Del.
Sorbaria sorbifolia A. Braun (*Spiraea sorbifolia* L.). Britton, Conn.
Spiraea sp. Britton, Conn.; Lintner, Felt, N. Y.; Alwood, Va.
Thuya occidentalis Linn. Arborvitæ. Fernald, Mass.
Viburnum sp. Britton, Conn.; Alwood, Va.
Viburnum cassinoides Linn. Britton, Koehler, Conn.
Viburnum opulus Linn. Koehler, Conn.
Vitis sp. Grapes. Britton, Conn.; Felt, N. Y.; Alwood, Va.; Butz, Pa.; Rolfs & Quaintance, Fla.; Johnson, Md.

NOT INFESTED.

- Ailanthus glandulosa* Desf. Tree of heaven.
Amorpha fruticosa Linn.
Andromeda sp.
Aralia spinosa Linn. Hercules' club.
Aristolochia macrophylla Lam. Dutchman's pipe.
Asimina triloba Dun. Papaw.
Baccharis halimifolia Linn. Groundsel tree.
Benzoin odoriferum Nees. (*Lindera benzoin* Blume). Spicebush.
Berberis (all species). Barberry, including *Mahonia*.
Bignonia sp. Trumpet vine.
Calycanthus floridus Linn. Carolina allspice, sweet-scented shrub.
Carpinus sp. Hornbeam.
Cedrus sp. Cedar.
Celastrus scandens Linn. Bittersweet.
Cephalanthus occidentalis Linn. Buttonbush.
Cercis canadensis Linn. Judas tree, redbud.
Chamædaphne calyculata Moench. (*Cassandra*). Leather leaf.
Chionanthus virginica Linn. Fringe tree.
Cladrastis tinctoria Raf. Yellowwood.
Clethra alnifolia Linn. Sweet pepper bush.
Corylus sp. Filbert, hazelnut.
Daphne mezereum Linn.
Diervilla sp. Weigela.
Dirca palustris Linn. Leatherwood, moosewood.
Exochorda grandiflora Lindl. Pearl bush.
Gaylussacia sp. Huckleberry.
Genista tinctoria Linn. Dyer's greenweed.
Ginkgo biloba Linn. Maidenhair tree.
Gymnocladus canadensis Lam. Kentucky coffee tree.
Halæsia tetraptera Linn. Silver bell, snowdrop tree.
Hamamelis virginiana Linn. Witch hazel.
Hedera helix Linn. English ivy.
Hicoria sp. (excepting *H. pecan* Britt). Hickory.
Hydrangea (all species).
Hypericum moserianum André. Gold flower.
Ilex sp.
Itea virginica Linn. Virginian willow.
Jasminum nudiflorum Lindl. Yellow jasmine.
Juglans cinerea Linn. Butternut.
Juniperus sp. Juniper.
Kæhreuteria paniculata Laxm. Varnish tree.
Laburnum vulgare Griseb. Golden chain.
Larix sp. Larch.
Liquidambar styraciflua Linn. Sweet gum.
Liriodendron tulipifera Linn. Tulip tree.
Lycium halimifolium Mill. Matrimony vine.
Magnolia (all species).
Myrica cerifera Linn. Wax myrtle.
Nyssa sylvatica Marsh. Tupelo, pepperidge, black gum, sour gum.
Ostrya virginica Willd. Hornbeam, iron wood.
Paulownia imperialis Sieb. & Zucc.

Phellodendron sp.
Philadelphus coronarius Linn. Mock orange, syringa.
Pinus sp. Pine.
Platanus occidentalis Linn. American plane, buttonwood.
Potentilla fruticosa Linn.
Quercus (all species). Oak.
Retinispora (all species). Japan cypress.
Rhamnus sp. Buckthorn.
Rhododendron sp.
Sciadopitys verticillata Sieb. & Zucc. Umbrella pine.
Shepherdia sp.
Smilax sp.
Sophora japonica Linn. Japan pagoda tree.
Staphylea sp. Bladder nut.
Stephanandra flexuosa Sieb. & Zucc.
Styrax japonica Sieb. & Zucc.
Tamarix sp.
Taxodium distichum Rich. Bald cypress.
Taxus sp. Yew.
Tecoma radicans Juss. Trumpet creeper.
Tsuga canadensis Carr. Common hemlock.
Vaccinium sp.
Wistaria sp.
Xanthoceras sorbifolia Bunge.
Xanthoxylum americanum Mill. Prickly ash.

Certain species have been reported as seriously infested in one part of the country and as exempt in other localities. Such plants have been placed in list No. 1. Quince is reported as being rarely infested, by Felt, of New York, and by Smith, of New Jersey. Sanderson writes that willows and poplars are not commonly infested in Maryland and Delaware, but in Connecticut willow hedges have been seriously infested, and young willow and poplar trees in nurseries have been thoroly incrustated by the scales. Cockerell reports that osage orange is not infested in New Mexico tho much grown, and that *Catalpa*, elm, and walnut have not been found infested. Apricot, quince, and poplar are also reported as not being infested in New Mexico. Alwood, of Virginia, Burgess, of Ohio, and Felt, of New York, place the sour cherry (*P. cerasus*) in list No. 2, tho I have never found it infested in Connecticut. Burgess suggests that Kieffer pear be placed in the same list, but it is reported by Alwood as being badly infested in Virginia. Linden was placed in list No. 1 by the commissioner of agriculture of New York, while the hop-tree (*Ptelea trifoliata*) was placed in the same list by Fernald of Massachusetts. Elm was placed in list No. 1 by Webster in Ohio and Troop of Indiana. Smith, of New Jersey, finds European elm, purple-leaved beech, and Japanese walnut badly infested, while the common quince, cherry (except on Japanese stock), apricot, and poplar are not commonly infested. He has not seen the scale on birch, linden, persimmon, *Catalpa*, *Acacia*, or *Buxus*. Alwood, of Virginia, puts the common privet (*L. vulgare*) in list No. 1, while Koehler, in Connecticut, mentions it as one of the plants upon which he has not found the scale, tho growing near infested plants. Gossard, of Florida; Scott and Fiske, of Georgia, report *Citrus trifoliata* as being badly infested, while Alwood, of Virginia, places this plant in list No. 2. *C. aurantium* the common orange, is rarely infested, according to Gossard.

In Connecticut the most commonly infested plants are apple, pear, peach, Japan plum, and currant among the fruits, tho sweet cherry, European plum, quince, and gooseberry are sometimes seriously injured.

The most commonly infested ornamentals are purple-leaved plum, *Cercocarpus*, Japanese quince, mountain ash, red-twigged dogwood, and *Rosa rugosa*. Poplar, willow, Persian lilac, *Cotoneaster*, elm (both American and European), and usage orange have been found thoroly incrustated by the insects, especially when growing near infested trees.

Of the plants which are reported as noninfested in this list probably many of them may be subject to slight or occasional infestation. Notwithstanding the San Jose scale's wide range of food plants, strangely enough certain varieties of pear seem to be almost never attacked, and are practically exempt from injury. This holds true also, to a less extent, with different varieties of other fruits. The striking illustrations are the Leconte and Kieffer varieties of pears, and the reason for this immunity is difficult to explain. Differences in the density and texture of bark could hardly account for it, because that would scarcely protect new and comparatively tender growth. A notable instance of the immunity of the Leconte pear is seen in the little grove connected with the insectary of this Department. This grove has been thickly planted to pear and apple trees, so that the branches are interlacing all the time, and it has been pretty badly infested with the San Jose scale off and on for ten years, and yet the 10 or 12 Leconte trees have been clean the whole time, while the rest, representing different varieties of pear, apple, peach, and plum, have died out or have been replaced, some of them over and over again.

CITRUS FRUITS AND THE SAN JOSE SCALE.

The susceptibility of the orange and lemon and other citrus plants to the San Jose scale is a matter of great interest to citrus growers. In catalogs of the food plants of the San Jose scale the orange and lemon and other citrus fruits are listed, notably in Mrs. Fernald's Catalog of Coccidæ. The facts on which this statement is based are rather meager, and, when examined, do not warrant any grave fears of injury to the ordinary cultivated citrus fruits. It is well known that the San Jose scale will infest rather freely the trifoliolate orange, a hedge plant somewhat closely related to the orange and lemon. Some trifoliolate trees, for example, on the Department grounds, are now rather thickly covered by the San Jose scale, but even in the case of this hedge plant the infestation is, as a rule, not serious, and, according to Mr. Gossard, the plant seems to throw the scale off as it grows. The first undoubted example of San Jose scale on orange was on certain hybrid sorts produced by crossing the trifoliolate orange with the sweet orange, and was received in 1903 from Mr. Gossard from Florida. Mr. Gossard stated that in a single instance where a small sweet orange tree interlaced with the branches of a badly infested trifoliolate orange the former had matured perhaps half a dozen San Jose scales.

The second undoubted record is of material sent to Doctor Howard for determination by Dr. James Fletcher, entomologist of the Canadian Central Experimental Farm at Ottawa, who reported that the infested oranges sent had been forwarded to him from British Columbia and had been imported from Japan. These oranges, evidently of a mandarin or tangerine type, showed undoubted infestation with the San Jose scale. It is therefore evident that this scale insect may occasionally infest the orange, but the long coexistence of the San Jose scale and orange culture in southern California would seem to indicate the practical immunity of the orange tree from this scale pest. An earlier record of the San Jose scale on a citrus plant, by Mr. Cockerell, has always been under the question of a misidentification of the food plant.

LIFE HISTORY.

In common with all the armored scales, the life round of this insect, with the exception of a few hours of active larval existence and an equally brief winged existence in the case of the mature male, is past under the protection of a waxy scale. This scale covering conceals the real insect beneath and prevents any easy observation or study of its life history. The San Jose scale has been under most careful observation by Mr. Pergande on potted plants in the insectary, and its history, which has hitherto been very imperfectly worked out, has been thoroly and carefully elaborated.

The winter is past by the insects in a half-grown condition under small black protecting scales, mere points, just visible to the naked eye. The male scales are normally vastly in excess of the females, often representing 95 or more per cent. Early in April, in this latitude, the males transform to pupæ and emerge, and this gives the appearance of a sudden death of the great majority of these overwintered insects on the bark, and has led to some confusion in interpreting the effect of washes. The females at this period have arrived at the stage of impregnation, and the delicate two-winged males disappear after a few days. About a month later, varying with the climate, the overwintered females come to full maturity and begin to give birth to a new generation, continuing to produce young for a period of upward of six weeks, when they reach the limit of production of young and perish.

The adult female gives birth immediately to living young, differing in this respect from most other scale insects. Ordinarily eggs are deposited beneath the scale, which in the course of a longer or shorter time hatch, and the young larvæ make their escape and migrate to different parts of the plant. In the case of some scale insects the female fills its scale with eggs in the fall and perishes, the eggs wintering over and hatching the following spring. In others the insect

hibernates in the nearly mature condition, as does the San Jose scale, and deposits eggs in the spring or early summer. The viviparous habit, or the giving birth to the living young, possessed by the San Jose scale, finds a parallel in many other insects and frequently in aphides. In the case of the San Jose scale the eggs are fairly well formed, a few at a time, within the body of the mother. What takes the place of the eggshell consists of a very delicate and thin membrane—the amnion—which incloses the developing larva and which at the moment of birth is cast off, and remains attached to or partly within the oviduct. The amnion is probably pushed out by the next larva in turn.

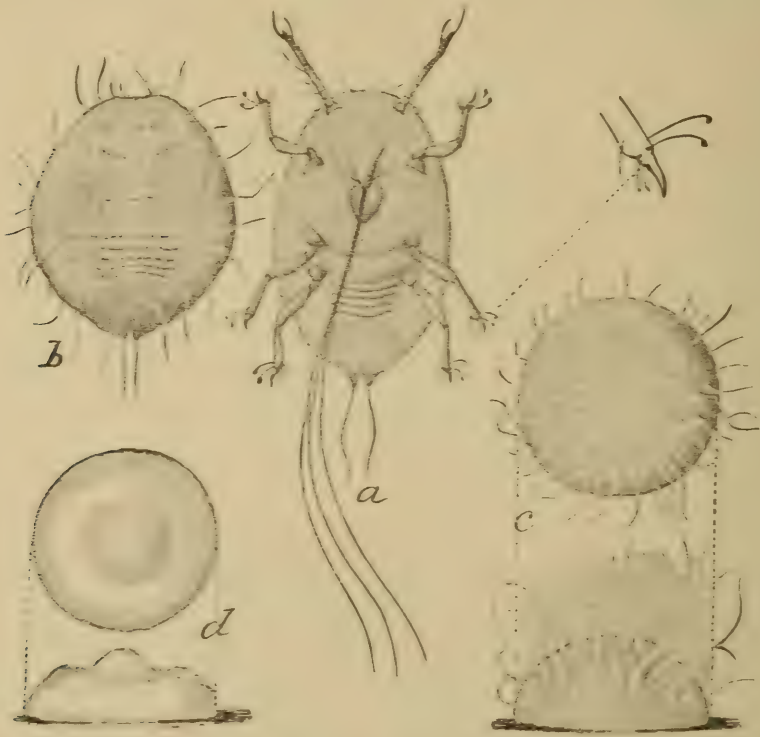


FIG. 3.—Young larva and developing San Jose scale (*Aspidiotus perniciosus*): *a*, ventral view of larva, showing sucking beak with setae separated, with enlarged tarsal claw at right; *b*, dorsal view of same, still more contracted, with the first waxy filaments appearing; *c*, dorsal and lateral views of same, somewhat contracted, illustrating further development of wax secretion; *d*, later stage of same, dorsal and lateral views, showing matting of wax secretions and first form of young scale. All greatly enlarged (from Howard and Marlatt).

The difference between this mode of birth and the ordinary method thru the medium of true eggs is simply that what corresponds with the egg is retained by the female until the larva is developed, instead of development of the larva progressing after the egg leaves the parent.

The emergence of the young from the female over a period of six weeks leads to a very confusing intermingling of generations and renders it difficult to make observations on the life history except by isolating and watching individuals. By means of such isolation of individuals, however, we have been able to most carefully trace the

different generations. The course of the development of a single generation follows:

After being expelled the larva remains motionless for a little while, with antennæ and legs folded beneath the body. It soon hardens enough to run about, and, forcing its way out from beneath the protecting scale of the mother, scurries over the plant to find a suitable place to settle.

The newly born larva (fig. 3, *a*) is an almost microscopic creature of pale orange-yellow color, with long oval body, and with the customary six legs and two feelers. The long thread-like proboscis with which the juices of the plant are sucked up is doubled on itself and lies in an invagination of the body wall, the tip only projecting.

After crawling about for a few hours the young larva settles down and slowly works its long bristle-like sucking beak thru the bark, folds its antennæ and legs beneath its body, and contracts to a nearly circular form. The development of the scale begins even before the larva becomes fixt. The secretion starts in the form of very minute white fibrous waxy filaments, which spring from all parts of the body and rapidly become more numerous and dense (fig. 3, *b*, *c*). At first the orange color of the larva shows thru the thickening downy white envelop, but within two days the insect becomes entirely concealed by the white or pale grayish yellow shell or scale, which now has a prominent central nipple (fig. 3, *d*), the younger ones often possessing instead a central tuft. The scale is formed by the slow matting and melting together of the filaments of wax. During the first day the scale appears like a very microscopic downy hemisphere. The matting of the secretion continues until the appearance of down and individual filaments is entirely lost and the surface becomes smooth. In the early history of the scale it maintains its pale whitish or grayish yellow color, turning gradually darker gray, the central nipple remaining lighter colored usually thruout development.

The male and female scales are exactly similar in size, color, and shape until after the first molt, which occurs twelve days after the emergence of the larva. With this molt, however, the insects beneath the scale lose all resemblance to each other. The males (fig. 4, *a*) are rather larger than the females and have large purple eyes, while the females have lost their eyes entirely. The legs and antennæ have disappeared in both sexes. The males are elongate and pyriform, while the females are almost circular, amounting practically to a flattened sac with indistinct segmentation, and without organs, except a long sucking bristle springing from near the center beneath. The color of both sexes is light lemon-yellow. The scales at this time have a decidedly grayish tint, overcast somewhat with yellow.

Eighteen days from birth the males change to the first pupal condition (pro-pupa) (fig. 4, *b*), and the male scales assume an elongate oval,

sometimes slightly curved, shape, characteristic of the sex, the exuvia or cast larval skin showing near the anterior end.

The male pro-pupæ are very pale yellow, with the legs and antennæ (which have reappeared), together with the two or three terminal segments, colorless. The eyes are dark purple and placed close together. The antennæ are stout and bent closely along the edge of the body as far as the first pair of legs, where they curve slightly inward. Prominent wing pads extend along the sides of the body. The terminal segment bears two short spines.

The female undegrees a second molt about twenty days from the larva. At each molt the old skin splits around the edge of the body, the upper half adhering to the covering scale and the lower forming a sort of ventral scale next to the bark. This form of molting is common to scales of this kind.

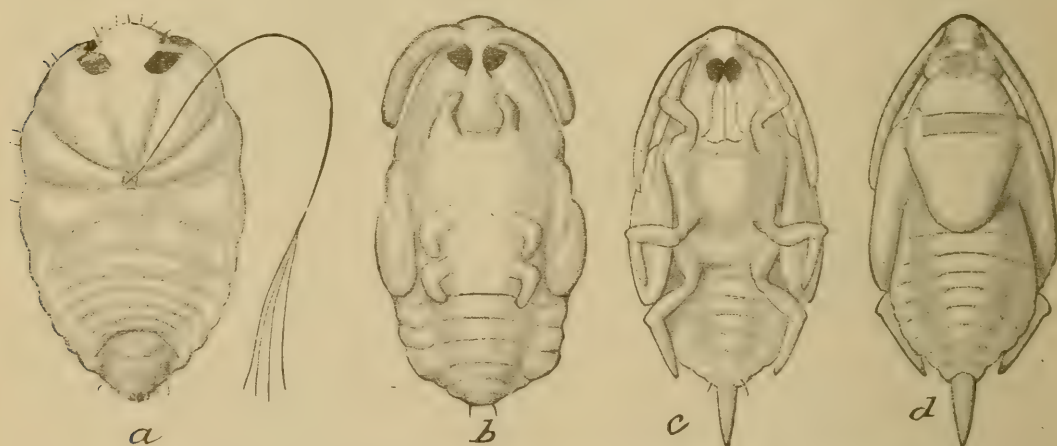


FIG. 4.—Development of male San Jose scale (*Aspidiotus perniciosus*): *a*, ventral view of larva after first molt; *b*, same after second molt (pro-pupa stage); *c* and *d*, true pupa, ventral and dorsal views. All greatly enlarged (from Howard and Marlatt).

The covering scales at this stage are of a more purplish gray, the portion covering the exuviae inclining to yellowish. The male scales are more yellowish than the female. The effect of the sucking of the insects is now quite apparent on the young growth, causing the bark to assume a purplish hue for some distance around the central portion, contrasting strongly with the natural reddish green of the uninjured bark. With the second molt the females do not change materially from their former appearance, retaining the pale yellow color with a number of transparent spots around the edge of the body. The sucking bristles are extremely long, two or three times the length of the body of the insect. The only distinctive features are in the last segment and are noted in the technical description.

About twenty days after birth the male insect transforms to the true pupa. With the first molt the shed larval skin is retained beneath the scale as in the case of the female; with the later moltings the shed skins are pushed out from beneath the scale. The scale after the

second molt presents on the inside two longitudinal ridges running from one end to the other, touching the sides of the pupa, and which apparently enable the insect to move backward or forward and assist the imago in pushing itself out.

The true pupa (fig. 4, *c*, *d*) is pale yellow, sometimes purplish, darkest about the base of the abdomen. The head, antennæ, legs, wing pads, and style are well formed, but almost colorless. The antennæ reach as far back as the second pair of legs and are not curved under, as formerly, but lie close to the sides of the body with the ends free. The first pair of legs is held forward, reaching slightly beyond the eyes, the middle femora projecting somewhat beyond the margin of the abdomen. The hind legs are inclined backward and reach to the end of the body. The style is rounded at tip, conical, and about as long as the posterior tibiæ.



FIG. 5.—*Aspidiotus perniciosus*: adult male, greatly enlarged (from Howard and Marlatt).

From four to six days later, or from twenty-four to twenty-six days from birth, the males mature and back out from the rear end of their scales, having previously, for a day or two, remained practically developed but resting under the scale. They seem to issue chiefly by night or in the evening.

The mature male (fig. 5) appears as a delicate two-winged fly-like insect with long feelers and a single anal style projecting from the end of the body; orange in color, with a faintly dusky shade on the prothorax. The head is darker than the rest of the body, the eyes are dark purple, and the antennæ, legs, and style are smoky. The wings are iridescent with yellow and green, very faintly clouded.

Thirty days from birth the females are full grown and the embryonic young may be seen within their bodies, each inclosed in a delicate

membrane. At from thirty-three to forty days the larvæ again begin to make their appearance.

The adult female, prior to the development of the young, measures 1 millimeter in length and a little less in breadth, and is pale yellow, with transparent spots near the margin of the body (fig. 6).

The length of a generation is determined by the female and, as shown by the above record, covers a period of from thirty-three to forty days. Successive generations were followed carefully thruout

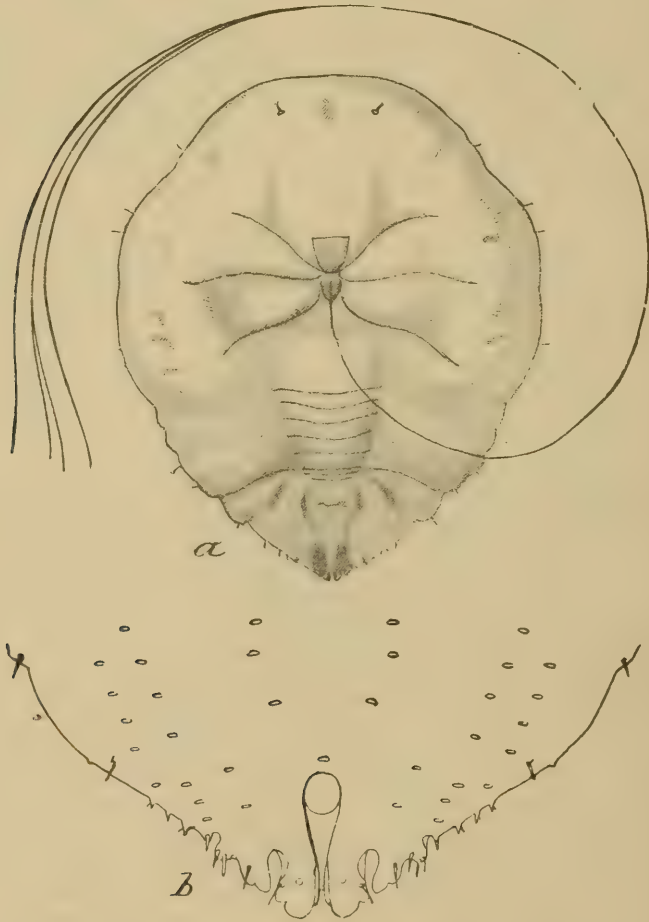


FIG. 6.—Adult female San Jose scale (*Aspidiotus perniciosus*) before development of eggs: a, ventral view, showing very long sucking setae; b, anal plate, showing characteristic ornamentation of edge. Greatly enlarged (from Howard and Marlatt).

the summer, and it was found that at Washington four full generations are regularly developed, with the possibility of a partial fifth generation. On a number of potted trees a single overwintered female was left to each tree. After the full progeny of this individual had gone out over the tree, all were removed again, except one of the oldest and fertilized females. This method was continued for each generation thruout the breeding season. Some interesting records, tabulated below, were thus obtained, which indicate the fecundity of the females as well as the number of generations.

Record showing fecundity of San Jose scale.

Number of tree.	Males.	Females.	Total.	Number of tree.	Males.	Females.	Total.
<i>Progeny of overwintered females.</i>				<i>Progeny of third generation.</i>			
1	72	34	106	1	110	307	417
2	77	43	120	2	122	464	586
3	138	60	198	3	190	284	474
4	18	22	40	4	187	400	587
5	98	60	158	5	174	280	454
6	33	25	58	6	107	274	354
7	13		13	<i>Progeny of fourth generation.</i>			
<i>Progeny of second generation.</i>				1	242	319	561
1	350	235	585	2	112	230	342
2	276	226	502	3	92	170	262
3	325	92	417	4	210	344	554
4	192	120	312	5	242	343	585
5	415	151	556	6	156	293	449
.....	206	124	330				

Perhaps the most notable feature of the foregoing records is the result obtained from the overwintered females. It will be seen that the males greatly predominate in this generation, and that the numbers of both sexes are insignificant compared with the progeny of the later generations. The males still predominate in the second generation, but in the third and fourth generations the females considerably outnumber the males, in one instance the females from a single mother reaching the astonishing number of 464, which, with 122 males from the same parent, makes the progeny of this female 586 insects. Taking 200 females as an average of the different generations for the year, the product of a single individual from spring to fall amounts to 1,608,040,200 females. In one instance we have over 415 males from a single female, and while the number of males would average somewhat less than the females, taking the summer thru, yet, having underestimated the females, the males may be estimated at the same number, giving a total of 3,216,080,400 descendants from a single insect in a single season. It is not to be expected, of course, that all the individuals from a scale survive and perform their function in life, but under favorable conditions, or in the case of a tree newly infested or not heavily incrustated, the vast majority undoubtedly go thru their existence without accident. Neither the rapidity with which trees become infested nor the fatal effect which so early follows the appearance of this scale insect is therefore to be wondered at.

Owing to the long period during which the female is continuously producing young the different generations or broods in the course of the summer are not distinctly marked and merge insensibly into each other—so much so that at almost any time there will be found young larvæ funning about over the trees and scales in all stages of development. Still, at certain times the young will be noticeably more abundant, indicating periods when the majority of each generation are producing young. In this latitude the first young appear, as noted, by the middle

of May; at Amherst, Mass., they were first noticed June 12, and in Arizona they are recorded as appearing in March. The larvæ are continuously present on the trees until further hatching is prevented by severe frosts. In 1894, as we have already shown on page 289 of Volume VII of *Insect Life*, the first frosts at Washington occurred in the latter part of October and the hatching of the young ceased before the 1st of November. October 24, 1894, however, Doctor Howard saw recently settled larvæ, not more than 5 days old, at Lewisburg, Pa. In 1895 the October frosts were insignificant, and in this neighborhood no severe frost occurred until about the 1st of December. The result was that young larvæ were found at Washington until late in November, while on twigs received from Chestertown, Md., November 13 and November 27, the young were more or less abundant. The cold spell of the last week in November and the first week in December put a stop to development here. This same cold spell was of very wide extent. As far to the southwest as San Antonio, Tex., the thermometer dropped to 31° on December 3. A similar, or even lower, temperature was noted at New Orleans, yet on December 16 Doctor Howard found newly hatched young, less than 24 hours old, upon a plum tree at Audubon Park, New Orleans.

In autumn, or when further development is stopt by cold weather, hibernation is begun by scales in all stages of development, from the white, minute, down-covered recently hatched young to the mature and full-grown females and males. Unquestionably many young perish during the winter, and normally in spring quite a percentage of the smaller or half-grown scales will be found to have perished. It is very probable that many females have union with the males in the fall, but the majority of them are unquestionably immature, and are fertilized in this latitude early in April by overwintered males which, as we have noted, appear nearly a month before the first young of the spring brood.

The actual rate of the production of young at different periods of the life of the adult female has not been determined with accuracy. As the average reproducing period of the adult female is six weeks, and as the average number of young from each female is about 400, there must be born from 9 to 10 young every twenty-four hours. The great labor of watching an individual female and removing every twenty-four hours the young she has given birth to during that period has not been entered upon. Sufficient observations have been made, however, to indicate that the main period of reproductive activity is the second or third week after the female has reached maturity. At first the young are born with less frequency, and there is a corresponding reduction in reproductive activity toward the end of the life of the individual. The young are born indifferently by day or by night, perhaps more during the day than during the night. In the morning,

however, examination of the trees under observation always shows many migrating young which must have been born during the night, while observations at nightfall show always as many, and frequently more, which have been born during the day.

The gradual production of the young by the female has an important bearing on the question of remedies, and the old washes, which aimed at the destruction of the young as soon as they emerge from the females, are rendered almost valueless because, to make them effective, it is necessary to repeat them many times during a period of six weeks. Within two or three days after hatching the young larvæ will have formed a scale which will be impervious to these weaker washes.

The larva does not ordinarily travel far from the parent insect, and usually rests within a few inches of the old scale or at the first available point. They will not, so far as observed, travel very far from the base of the tree, and in the potted trees none were observed to go more than 2 inches from the base of the trunk.

DESCRIPTIONS OF SCALE AND INSECT.

Scale of female.—The scale of the female is circular, very slightly raised centrally, and varies in diameter from 1 to 2^{mm}, averaging about 1.4^{mm}. The exuvia is central or nearly so. The large, well-developed scales are gray, excepting the central part covering the exuvia, which varies from pale to reddish yellow, altho in some cases dark colored. The scale is usually smooth exteriorly or sometimes slightly annulated, and the limits of the larval scale are always plainly marked. The natural color of the scale is frequently obscured by the presence of the sooty fungus (*Fumago salicina*).

Scale of male.—The mature male scale is oblong-oval, nearly twice as long as wide, and averaging in length about half the diameter of the female scale. The position of the larval scale is marked by a nipple-like prominence located between the center and the anterior margin of the scale. The scale of the male is usually darker than that of the female, sometimes black, but often gray, the larval scale covering the exuvia very frequently light yellow, as with the female. Not uncommonly the circular scale, formed prior to the first molt, is black, while the later additions, giving it its oblong shape, are gray.

The scale covering of the hibernating insects in winter is black, and on the bark in summer also the scale covering is dark or often blackened by the sooty fungus referred to. But the normal color of the scale of both female and male is light, and on the leaves of pear, for example, the male scales are often a very light buff, and present such a marked contrast to the winter appearance that no one would suspect them of belonging to the same insect.

Egg.—The egg is never (or rarely) extruded as such by the female, and as it exists within the body of the mother is a mere amniotic mem-

brane, and the forming embryo showing through gives it a yellowish-white color. The embryo with the envelop measures about 0.2^{mm} long by 0.1^{mm} wide.

Newly hatched larva.—The young larvæ of both sexes are alike, and are pale orange in color, with long oval bodies. They measure in length about 0.24^{mm} by 0.1^{mm} in width. The sucking bristles are normally doubled on themselves, but when unfolded are nearly three times the length of the body. The antennæ are apparently five-jointed, the last two joints being much longer than the others, slender, subequal in length, and both finely and distinctly annulated. The last joint bears a small nipple-like projection near the tip. The head is somewhat concave in front, and the eyes are nearly transparent and slightly purplish. The terminal segment of the abdomen foreshadows in structure the plates and spines of the adult female. The large central plates each terminate in a long hair. The tarsus is represented by apparently a single, strong, slightly curved claw. The tip of the tibia bears exteriorly two rather long capitate hairs, and two similar hairs project also from the inner extremity. Other details of structure are shown in the illustration.

Larva of the second stage.—After the first molt the difference in the sexes becomes apparent, altho the covering scales are still identical.

The female insects are somewhat smaller than the males at this stage. The eyes, legs, and antennæ in this sex have entirely disappeared. The form is almost circular, flattened. The color is yellow, with irregular transparent spots appearing in different parts of the body.

The males are somewhat larger than the females, elongate, pyriform. The eyes are prominent, purple in color. The legs and antennæ, as with the females, are wanting. The general color of the body is yellow, with the irregular transparent spots noted in the case of the female. The greatest diameter in both sexes is less than one-half a millimeter, and in the characteristics of the terminal segment both agree, practically, with the adult female.

Male pro-pupa.—With the second molt the male assumes a form foreshadowing the true pupa, which may be called the pro-pupa.^a The form is elongate oval; length 0.5^{mm} . The color is very pale yellow, with the antennæ, limbs, and wingpads, and two or three terminal segments of the abdomen, colorless. The legs and antennæ, as noted, have reappeared, and also prominent pads foreshadowing the wings of the adult. The eyes are dark purple and placed close together. The antennæ are very stout, and curved closely around the edge of the body as far as the anterior legs, where they bend inward. The

^a The existence of a pro-pupa or a first pupal stage in the Coccidæ analogous to the first pupal stage of higher Hemiptera has also been affirmed by Dr. Fr. Loew. (Wiener Entom. Zeit., Jan., 1884, p. 13.)

wingpads are stout and almost entirely cover the abdomen. The terminal segment is still broad and flattened and bears two short spines, but the other characters have disappeared.

True pupa of male.—The true pupa resembles the previous stage, except that the members are longer and slenderer, and the prominent anal style has appeared. The pupa is pale yellow and purplish in color, darkest about the base of the abdomen, the head, antennæ, legs, wing sheaths, and style being almost colorless and transparent. The eye spots are dark purple. The antennæ extend nearly to the middle femora, and are not curved under the body as formerly, but are applied close to the sides with the apex free. The anterior legs are held forward, reaching slightly beyond the eyes. The middle femora rest transversely to the body, projecting somewhat beyond the margin of the abdomen, while their tibiæ form with them a right angle and reach nearly to the apex of the hind femora. The latter incline posteriorly, while the hind tibiæ are applied close to the sides of the body, except toward the tip, and reach nearly to the base of the style. The style is rather stout, conical, obtusely pointed at tip, and about as long as posterior tibiæ. Length, 0.8^{mm} , including style, which measures about 0.15^{mm} .

Mature male.—The general color is orange with a faint duskiness on the prothorax. The head is somewhat darker than the rest of the body. The eyes are dark purple, almost black. The antennæ are yellow, somewhat obscure or smoky. The legs and style are dusky, the latter paler than the former. The thoracic shield is regularly ovoid, compressed anteriorly, dusky in color, with margin brown, more distinctly so anteriorly; transverse band narrow, brown. Antennæ 10-jointed, two basal joints shortest, second nearly globular, inserted in the first; joints 4 and 5 subequal, longer than any of the others; joint 6 next in length, and joints 3, 7, and 9 shorter and subequal; joint 10 still shorter, conical. Antennæ somewhat hairy and nearly as long as the body of the insect. Wings faintly dusky, iridescent with yellow and green. Length of body about 0.6^{mm} ; style, 0.25^{mm} .

Female, third stage.—After the second molt the females still appear pale yellow as before, with various larger and smaller transparent spots around the border of the body. The form is nearly circular, with greatest diameter averaging 0.56^{mm} . The sucking bristles are very prominent and long, three times the length of the insect. The last segment in this stage has practically the characters of the mature female, as follows: There are two pairs of lobes, the terminal ones largest and nearly three times as broad as the other lobes. Terminal lobes are rounded at the apex and are distinctly notched near the middle of the external edge. The second pair of lobes is smaller and narrower, and is also notched externally. Between the first and second lobe on either

side is a small spine, and two or three such spines are just back of the second lobe, while back of these are three stout teeth curving anteriorly. A still smaller blunt tooth sometimes occurs near the middle of the lateral margin. The segmentation of the body at this stage is quite distinct.

Mature female.—After reaching maturity the embryonic young are at first not visible, but later the body becomes filled with them. The mature female measures 0.8^{mm} wide by about 1^{mm} long.^a

The following description of this stage is reproduced from Comstock:

The body of the female is yellowish and almost circular in outline; the segmentation is distinct, tho not conspicuous. The last segment presents the following characters:

There are only two pairs of lobes visible: the first pair converge at tip, are notched about midway their length on the lateral margin, and often bear a slight notch on the mesal margin, near the tip. The second pair are notched once on the lateral margin.

The margin of the ventral surface of the segment is deeply incised twice on each side of the meson, once between the bases of the first and second lobes, and again laterad of the second lobe. On each side of each of these incisions is a club-shaped thickening of the body wall.

There are two inconspicuous simple plates between the median lobes, and on each side similar plates extending caudad of the first incision, three small plates serrate on their lateral margin caudad of the second incision, and the club-shaped thickenings of the body wall bounding it, and three wide prolongations of the margin between the third and fourth spines. These prolongations are usually fringed on their distal margins. There are also, in some, irregular prolongations of the margin between the fourth spine and the penultimate segment.

The first and second spines are situated laterad of the first and second lobes, respectively; the third spine laterad of second incision, and the fourth spine about one-half the distance from the first lobe to the penultimate segment.

SYSTEMATIC POSITION AND RELATIONSHIPS.

The San Jose scale was described by Professor Comstock from material collected in 1880 in Santa Clara County, Cal., on apple, pear, plum, and other fruit trees.^b The relationships of this scale insect have been discust by various authors, notably by Prof. T. D. A. Cockerell, without, however, reaching a very good solution, in the judgment of the writer. Without going into a detailed technical discussion, the San Jose scale is quite as closely allied in structure, scale covering, and habit with the *Aonidiella* group as it is with the group including *uncylus* and *ostreaformis*. It is a very distinct and well-marked species, however, and is always easy of identification after one becomes once familiar with its principal characteristic structural features, and it is one of the few scale insects which can ordinarily be

^a Rept. U. S. Dept. Agric., 1880, p. 304.

^b Report of the Entomologist, in the Report of Commissioner of Agriculture for 1880 (1881), pp. 304, 305.

safely identified from the appearance of the scale covering and without being prepared for microscopical study.

Three varieties of the San Jose scale have been designated, none of which are valid. Of these *Aspidiotus perniciosus* var. *albopunctatus* Ckll. was described from twigs of a supposed orange seedling sent from Japan and stopt by Mr. Craw in his quarantine work in San Francisco. The twigs are thorny and may possibly be of the trifoliate orange or of some orange seedling, but whether of ordinary orange or tangerine or some other horticultural variety can not be determined. From the extreme unlikelihood of the San Jose scale attacking ordinary orange, the probability is very strong that these seedlings were either trifoliate or of the mandarin or tangerine types. At any rate, the scale itself is typical San Jose scale, and there is no basis whatever for the separation of these specimens as a variety. The character on which the variety was founded, namely, the white dot surrounded by a black ring marking the exuvia, is a feature which may be very commonly found in the San Jose scale from any source.

The other variety established by Mr. Cockerell is his *Aspidiotus perniciosus* var. *andromelas*, first described in California Fruit Grower, June 5, 1897, on a plant labeled "*Phaetenia glauca*," from Japan, also received from Mr. Craw. This variety is also based on the character of the covering scale, and is described as wholly black without any light dot and ring, a condition which is easily produced by rubbing or otherwise accidentally and may occur anywhere.

A third synonym of the San Jose scale is Maskell's species *Aspidiotus fusca*, described in the New Zealand Transactions, Volume XXVII, page 43, 1894, figures 6-9, Plate I. This insect was described from material collected in Australia on peach; and from Maskell's own figures and account of it, and also from the study made by Leonardi in Italy, and from the later note on the subject by Maskell himself in the Canadian Entomologist, it is evident that this species was based on material representing the last stage of the female of *perniciosus*, but before the secretory supplement had been much if any developed, so that the second exuvium was still larger than the newly molted insect. This point can not, of course, be fully determined without an examination of type material, but there is very little doubt in the writer's mind of the correctness of this reference.

A fourth variety is *Aspidiotus perniciosus* var. *eucalypti* Fuller. A study of material received from Fuller of this variety indicates that it should not be referred to the San Jose scale at all, but is a good distinct species belonging to the genus *Aonidiella*, and the name becomes *Aonidiella eucalypti* Fuller.

No valid varieties or subspecies of the San Jose scale have therefore been found, and all of the points of infestation now known can be traced directly to the Chinese origin of the scale.

MEANS OF DISTRIBUTION.

From an economic standpoint the important considerations in the means of spread of this insect are those which affect its wide distribution from one part of the country to another. The transportation by nursery stock or scions or budding and grafting material, as indicated in the foregoing account of this insect, is unquestionably the usual and principal means of carrying the insect to a distance. The importance of this means of distributing various insects has only been fully realized in this country in the last few years, but the present instance and some other notable ones of like nature have emphasized the great danger incurred not only in the indiscriminate introduction of plants from foreign sources, but also in the carriage of plants from one part of the country to another without competent inspection.

The San Jose scale is also frequently carried about on fruit, particularly of the apple and pear. The young scale insect goes out on the fruit, and in the case of badly infested trees there is usually a good deal of scale on the fruit particularly, massed at the blossom and stem ends. The scale may go on breeding on such fruit and the young may be found crawling about on the fruit and in the boxes. Such fruit is commonly shipped to remote points, and infested fruit may be found quite commonly in the markets of this country; and when attention was drawn to the San Jose scale by its first developing in the East, infested fruit from California could be found in almost any of the fruit markets of the principal eastern cities.

The shipping of infested fruit from California had been going on for a great many years, and in spite of its wide dissemination in this country, and to some extent abroad, there is not, so far as the writer knows, a single authenticated instance of the scale having been established from such material. The possibility of it, however, undoubtedly exists, but the danger seems to be inconsiderable. The fruit is eaten in such places and the parings and waste material are usually disposed of in such a way that it would be very exceptional indeed for such fruit, or the young scale that might hatch on them, to get access to trees on which the scale could make lodgment. It would practically be necessary for the parings to be tied to a tree, or the fruit to be placed in the crotches of the tree, to secure infestation, and it is the belief of the writer that infestation from this source can be practically ignored. This has an important bearing on the legislation against American fruits enacted by various foreign countries, and certainly the history in this regard in the United States is well worth considering where such fruit was shipped about for years prior to the San Jose scale scare without restrictions. The wide distribution, therefore, of the San Jose scale is substantially limited to its carriage on nursery stock and cuttings.

The local spread of the insect from orchard to orchard and from tree to tree must also be brought about thru the agency of means other than those under the control of the insect itself. The female is wingless and after once becoming fixt can not move. The young lice, as before stated, are active, crawl rapidly, and may reach other trees, but this is rare unless the limbs interlace, since we have shown by breeding-cage experiments that the larvæ normally crawl but a few inches. Such spread, however, is comparatively insignificant except in the case of nursery stock, which is grown close together. It is possible that strong winds may carry the young bodily from one tree to another, or they may be floated on water to distant points, particularly in irrigated districts, but the principal method of the spread of these young lice is by means of other insects and by birds. The active young lice soon crawl upon any small winged insect, particularly if the latter be of a dark color, and may thus be carried considerable distances. They are frequently found crawling upon ants, which are great travelers. It is extremely probable that they also crawl upon the feet of birds, and may be transported by these carriers for many miles.

Some interesting observations have been made by Mr. Schwarz upon the transporting of these scale larvæ by other insects. A little black ladybird, *Microweisea (Pentilia) misella* Lec., which was very active in devouring scale larvæ, was unfortunately equally efficient in transporting many of these young lice to other parts of the tree or to other trees; in fact, it was difficult to find a single beetle which did not carry on its back at least one larva of the San Jose scale, and sometimes three or four were found upon a single wing cover of a beetle. The small black ant, *Monomorium minutum* Mayr, was particularly abundant upon pears, attracted by the juices emerging from cracks, and almost every one of these insects carried on its back one or more specimens of the young scale insects. Specimens of the little chrysomelid beetle *Typophorus canellus* Fab. were also found upon the trees. Both red and black specimens of this beetle occurred, and the interesting observation was made that while *Aspidiotus* larvæ crawled freely on the black individuals, no specimens were to be found upon the red ones. The same peculiarity was found to hold true with the ants. The red ant, *Formica schaufussi* Mayr, was abundant upon the pears, but no specimens were found bearing *Aspidiotus* larvæ, while, as just stated, the little black *Monomorium* was always found carrying them.

As illustrating this transportation of the scale by birds or insects the experience at Riverside, Md. (Bul. 3, p. 25), may be cited, and Professor Smith reports a similar instance in New Jersey, in letter of January 13, 1896.

In spite of the abundance of insects which may transport the larvæ the progress of the scale from infested trees to noninfested trees is

slow where trees are moderately widely separated, and usually an entire orchard will not become affected from a single original point for several years.

Occasionally the young scales may be locally transported by men or teams. An interesting case in point is given by Professor Rolfs. He states that some melons growing in an infested orchard were given by the owner to a friend, who took them away from the orchard in his wagon. A year later the scale developed on a tree under which the team had been hitched while the melons were unloaded. As this orchard was entirely free from the scale originally, it seems to be a reasonable inference that the young had crawled upon the wagon, harness, or melons, were conveyed a distance of 3 miles, and succeeded in gaining access to a tree which probably touched the wagon or team during the interval of unloading.

PARASITES AND OTHER NATURAL ENEMIES.

The following paragraphs, under the heading "True parasites," were prepared for this bulletin by Dr. L. O. Howard.

TRUE PARASITES.

Some eight species of true parasites have been reared from the San Jose scale in this country. Nearly all of these are widespread, occurring on the Pacific coast, and generally also in the East, and are found also in other parts of the world. None of them are specific enemies of the San Jose scale in the sense that they are limited to this species of scale, but all of them are general parasites on other armored scale insects. They are as follows:

Aphelinus fuscipennis Howard.

Aphelinus mytilaspidis Le Baron.

Aspidiotiphagus citrinus Howard.

Anaphes gracilis Howard.

Physcus varicornis Howard.

Prospalta aurantii Howard.

Ablerus elisiocampæ Ashmead.

Rhopoideus citrinus Howard.

Of these *Aspidiotiphagus citrinus*, *Prospalta aurantii*, *Aphelinus fuscipennis*, and *Aphelinus mytilaspidis* are of very wide distribution. *Aspidiotiphagus citrinus*, for example, originally described from California in 1891, is now found in many other portions of the United States, in the West Indies, Italy, Austria, Ceylon, China, Formosa, Japan, Cape Colony, Queensland, South Australia, and Hawaii, and this remarkable distribution is practically followed by the other three.

The most important of these parasites is the little *Aphelinus fuscipennis*. It was reared in large numbers by Mr. Coquillett, in California, many years ago, where it was found to breed thruout the year,

specimens being reared as late as November 10. It was subsequently reared many times by Mr. Alexander Craw, Mr. E. M. Ehrhorn, and others, in California. In the East it attacked the San Jose scale at the very outset, having previously existed in this part of the country as a parasite of other species of Diaspinæ. It was reared in this office from material collected at Riverside, Md., and Charlottesville, Va., and also from the material collected in the first orchards found infested, by Prof. J. B. Smith, of New Jersey. Professor Forbes has reared it in Illinois from the San Jose scale, and it has often been reared in Washington. That this insect has been steadily on the increase seems likely, but it is also probable that there is a certain periodicity in its increase. In Bulletin No. 57 of the Maryland Agricultural Experiment Station, published in August, 1898, Prof. W. G. Johnson stated that he did not think it possible to secure any immediate beneficial results from this parasite in the State of Maryland. He said that in all his efforts to secure them in his breeding cages he had been obliged to inclose hundreds of thousands of scales to obtain one parasite. Less than two years later, however,^a he stated that in a new locality for the San Jose scale, near Easton, Talbot County, Md., he found the parasites in enormous numbers. A quantity of small branches incrustated with the scale were brought to his laboratory and inclosed in breeding tubes. Much to his surprise these tubes were swarming with parasites a few days later. From one tube 1,114 specimens of *Aphelinus fuscipennis* were taken, while a second tube gave 432, a third 1,478, and a fourth more than 1,000. The other scale insects infested by this parasite are *Aspidiotus rapax* Comst., *Aspidiotus euonymi* Targ., *Lepidosaphes gloverii* Pack., and *Lepidosaphes ulmi* L.

Aphelinus mytilaspidis Le Baron is another important parasite which was reported in earlier publications as attacking the San Jose scale in California, where it was reared in Santa Clara County by Mr. E. M. Ehrhorn. It is also a common and widespread species, and infests, aside from the San Jose scale, *Lepidosaphes ulmi*, *Chionaspis pinifoliæ* Fitch, and *Diaspis carueli* Targ. In the East it is the commonest parasite of the oyster-shell scale of the apple. It has only recently been found to attack the San Jose scale, and it is an encouraging feature that this and other eastern species have at last found a host satisfactory to themselves in *Aspidiotus perniciosus*. It was last year (1905) reared at this office from San Jose scale collected at Washington, D. C., by Mr. A. A. Girault, and at Youngstown, N. Y., by Mr. A. L. Quaintance.

Aspidiotiphagus citrinus Howard (fig. 7) is one of the most important parasites of armored scales in California, to which State it was evidently imported from oriental regions. In California it has been

^a Bull. No. 26, new series, Division of Entomology, U. S. Dept. of Agr., pp. 73, 74.

repeatedly reared from the San Jose scale, but it is also known to attack *Chrysomphalus ficus* Ashm. and *C. aurantii* Mask. variety *citrinus* Coq. It has made its way to the East and has been reared from the San Jose scale received from Hampton, Fla., where it was collected by Mr. A. L. Quaintance. This species seems to be found only in the warmer countries, and has not been found north of Florida in the East as yet.

Anopheles gracilis Howard, which was reported in Bulletin No. 3 as originally reared from specimens collected at Riverside, Md., and later from twigs received from Charlottesville, Va., has not again been reared in this office from the San Jose scale, and the doubt expressed in our original note may be valid, namely, that this species may have been a parasite of some other scale insect, probably the oyster-shell scale, present on the twigs at the same time. The type of the species was reared from the oyster-shell scale of the apple, and it is quite likely to be an egg parasite only.



FIG. 7.—*Aspidiotiphagus citrinus*, greatly enlarged (from Howard).

The four species just mentioned were recorded in Bulletin No. 3. During the summer of 1905 three other species have been reared by Messrs. Quaintance and Girault. These are as follows:

Phycus varicornis Howard was reared from material collected by Mr. Quaintance, May 30, 1905, at Hampton, Fla. There remains a little doubt as to the parasitism of this species on *perniciosus*, as according to the note there may possibly have been other hosts present. The known hosts of this species are *Aspidiotus ancylus* Putn., *Chionaspis quercus* Comst., and *Chionaspis americana* Johnson.

Prospalta aurantii Howard (fig. 8) was reared from the San Jose scale July 31, 1905, from material collected from an infested pear tree on the grounds of the Department of Agriculture, at Washington. This parasite affects no less than nine distinct species of scale insects, and has been reared from material collected in California, Florida, District of Columbia, New York, New Mexico, and Illinois.

Alerus clisiocampæ Ashm. (fig. 9) was reared in the summer of 1905 by Messrs. Quaintance and Girault from the San Jose scale occurring upon pear upon the Department grounds, at Washington.



FIG. 8.—*Prospalta aurantii*, greatly enlarged (from Howard).

It was also reared from *Diaspis pentagona* Targ., occurring upon the grounds of the Department. It affects also *Chionaspis furfurus* Fitch, and is known to occur in North Carolina, in Illinois, and in the District of Columbia.



FIG. 9.—*Alerus clisiocampæ*, female, greatly enlarged (from Howard).

Rhopoideus citrinus How. was reared in 1885 by Mr. Albert Koebele at Truckee, Nevada County, Cal., from *Aspidiotus perniciosus* on pear, and was described by the writer in the proceedings of the U. S. National Museum, No. 1142, October 4, 1898. This record was

overlooked in earlier publications from this Bureau, and the species has not since been reared from any scale in any part of the country. The Koebele 1885 specimens are unique so far as known.

PREDACEOUS INSECT ENEMIES.

NATIVE AND INTRODUCED ENEMIES OF OTHER SCALE-INSECTS.

Practically all of the scale-feeding Coccinellidæ, or ladybirds, may feed on the larvæ or older specimens of the San Jose scale. A dozen or more different species of ladybirds have been recorded in this country as attacking this scale insect. Our most important native scale-feeding ladybird (*Chilocorus bivulnerus* Muls.), commonly known as the twice-stabbed ladybird, and represented by one species or by a number of closely allied forms in different sections of the country, has not proven very efficient against the San Jose scale, at least in the East, altho commonly found in infested orchards. Its presence in eastern orchards, however, may often be accounted for by its being attracted by other native scale insects present in the same orchards. It is a slow breeder, having in the North at least but one brood annually, and seems to give very little promise of being of any great value as a means of controlling the San Jose scale in these sections of the United States. In California and elsewhere on the Pacific coast, but particularly in the Pacific coast region, the twice-stabbed ladybird is a much more active and important means in keeping the San Jose scale in check. It has been reported as multiplying enormously in infested orchards in California and almost effecting the extermination of this scale. Such a report was sent to us by Mr. N. W. Motheral relative to orchards in Tulare County, Cal.^a

A large number of Coccinellidæ imported by Mr. Koebele into California and colonized there have been reported as attacking the San Jose scale. The following species have been observed to have developed this habit: *Rhizobius debilis* Black, *Oreus australasiæ* Boisd., *Rhizobius lophanthæ* Blaisdell, *Oreus chalybeus* Boisd., and *Microweisea*^b (*Pentilia*) *misella* Lec. The last named of these only is of any importance as a means of controlling the San Jose scale.^c Another

^a See Insect Life, Vol. V, p. 53.

^b See Cockerell, Can. Entom., Vol. XXXV, No. 2, p. 38, February, 1903.

^c The efficiency against scale insect pests of citrus trees of certain of Mr. Koebele's importations of foreign ladybirds into California led the State Horticultural Society of New Jersey to secure in 1896 from the State legislature an appropriation of \$1,000 for the purpose of importing into the State of New Jersey the natural enemies and parasites from other States and countries. Acting under this appropriation, Dr. John B. Smith, entomologist of the experiment station of New Jersey, visited California and sent a large quantity of several species of Australian ladybirds to various places in New Jersey, and some to Washington, D. C. Subsequent records of these importations indicated that they were all unsuccessful, and not a sign of the imported insects could be found in 1897. (See Report of Entomologist, New Jersey, 1897.)

and very interesting species of *Microweisea*, recently described, also attacks the San Jose scale, and is referred to below.

Rhizobius lophanthæ was originally described from specimens found preying upon the San Jose scale at San Diego, Cal., but belongs to a lot which was introduced by Mr. Koebele on his first Australian trip (1888-89) and subsequently lost sight of, and was described by Doctor Blaisdell under the supposition that it was a new California species.

Of our native predaceous insects attacking the San Jose scale, the most useful and interesting is the little coccinellid *Microweisea misella* (fig. 10), which in both the larva and beetle state feeds upon this scale. It has a very wide range, occurring thruout the East and also

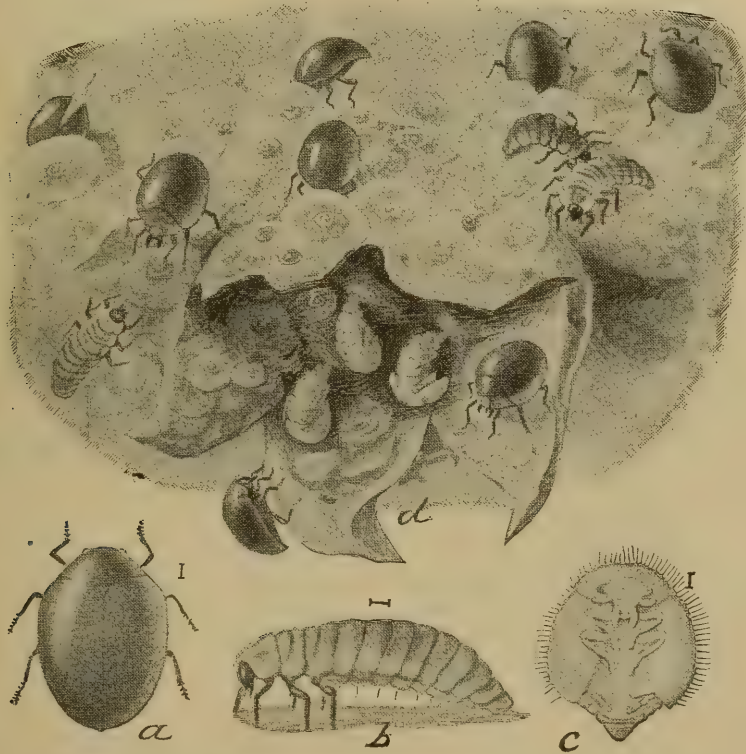


FIG. 10.—*Microweisea* (*Pentilia*) *misella*: a, beetle; b, larva; c, pupa; d, blossom end of pear, showing scales with larvæ of *Microweisea* feeding on them, and pupæ of *Microweisea* attached within the calyx. All greatly enlarged (from Howard and Marlatt).

in California, and began to attack the scale in numbers in the East in the first infested orchards discovered. This beetle was figured and its habits briefly indicated in Bulletin 3. The parent beetles prefer the full-grown female scales, and may frequently be observed standing astride the scale, almost on end, pushing their heads under the margin of the protecting scale to get at the soft, yellow insect beneath. The larvæ of these beetles seem to feed more abundantly on the young scales. Their mode of attacking the older scales was not observed. The egg of this particularly useful coccinellid has not been found, but a favorite place for pupation was discovered within the calyx of the pears. This cavity is often literally filled with a mixture

of young and old scale-insects, and frequently contains full-grown *Pentilia* larvæ, their pupæ, and freshly issued beetles. (See fig. 10.)

This beetle was originally believed to be essentially an eastern species, and the fact that it attacked the San Jose scale so efficiently at the very outset was an interesting entomological experience, and led Doctor Howard to suggest its immediate introduction into California, and one colony was sent, in 1894, to Professor Woodworth, at Berkeley. Our account of this useful beetle having come to the attention of Mr. J. E. McIntyre, of Lespe, Cal., he urged us to procure for him some living specimens. Having already sent material to Mr. Woodworth, we were not immediately able to get a supply of the insects for a sending, but at this juncture we received from Mr. G. W. Harney, of Marysville, Cal., some beetles for determination, which proved to be *Microweisea misella*. He reported that in the mountainous regions of Yuba County many apple trees had been very badly infested with *A. perniciosus*, and that hundreds of these little ladybirds were found preying on the scale. The occurrence of this ladybird in California as thus determined, and the fact that it there had the same useful habit, was a most interesting discovery. We immediately had Mr. McIntyre's request transferred to Mr. Harney for attention. It is more than likely that this little beetle is already widely distributed over the Pacific slope, and it may prove to have a continental distribution instead of being restricted to the East, as originally supposed.

Another species of about the same size as *Microweisea misella*, but dark wine-red in color and representing a distinct species, has been under observation for some time by Mr. Frederick Maskew in southern California, and at the time of the writer's visit to California in the autumn of 1903 his attention was called to this scymnid, and some material was collected and submitted to Mr. E. A. Schwarz, who pronounced it to be an undescribed species. Mr. Maskew states that this little scymnid is always associated with the San Jose scale, and seems to be doing pretty good work against it. Mr. Schwarz has published a description of it under the name *Pseudoweisea suturalis*.^a

A small predaceous beetle, *Collops quadrimaculatus* Fab., was observed by Mr. Schwarz at Charlottesville, Va., feeding on the larvæ of the San Jose scale. This beetle belongs to the family Malachiidæ, concerning the life history and food habits of which very little is known. Evidently these beetles are in part at least predaceous, as evidenced by this observation by Mr. Schwarz. This beetle is, however, not abundant enough apparently to have any practical value as a means of controlling the San Jose scale.

^aProc. Ent. Soc. Wash., Vol. VI, No. 2, April, 1904, pp. 118, 119 (issued May 21, 1904). The name *Pseudoweisea* was used by mistake for *Microweisea*.—ED.

THE ASIATIC-LADYBIRD ENEMY OF THE SAN JOSE SCALE.

Thruout the region investigated in China and Japan (see pp. 11-15), wherever the San Jose scale occurred, apparently the chief natural agency in keeping it in check was a small ladybird, *Chilocorus similis* Rossi (figs. 11, 12, and Pl. VII), which feeds upon the scale voraciously. This beetle is almost identical in appearance with the twice-stabbed ladybird of this country, *Chilocorus bivulnerus*, in the adult stage, but in the larval stage differs from it distinctly in coloration.

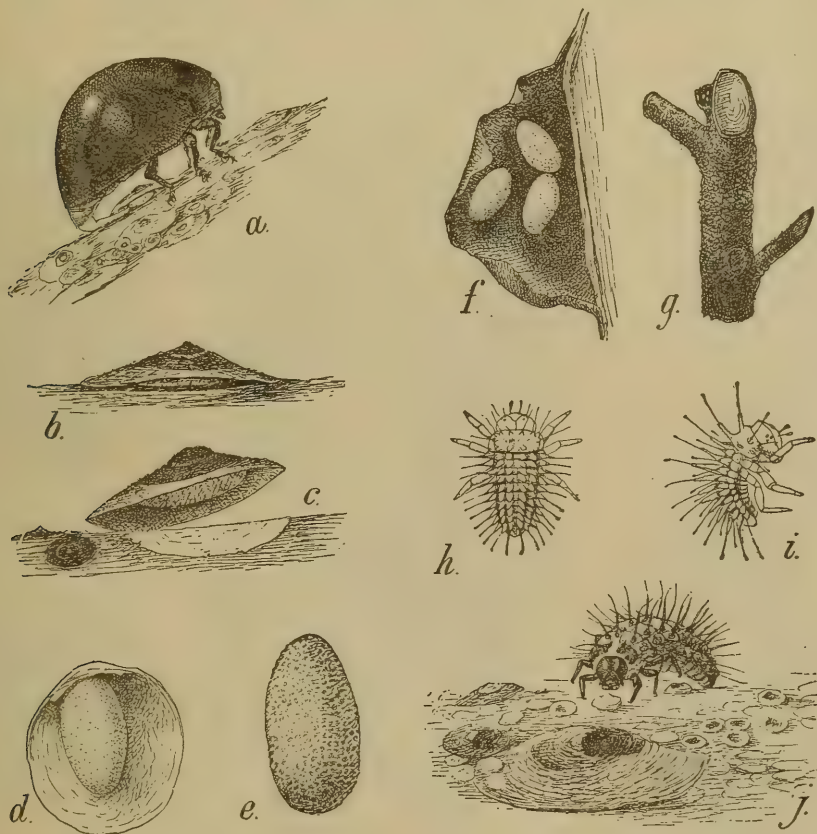


FIG. 11.—Asiatic ladybird (*Chilocorus similis*), oviposition and early larval stages: *a*, beetle in act of thrusting egg beneath scale; *b*, scale slightly raised, showing edge of egg beneath; *c*, scale lifted from bark, showing manner of attachment of egg to the inner surface; *d*, view of egg in the scale; *e*, egg magnified to show sculpturing; *f*, three eggs placed under flap of bark; *g*, same, natural size; *h*, *i*, dorsal and lateral views of newly hatched larva; *j*, larva, first stage, feeding on mature and young scales. All enlarged except *g* (author's illustration).

The Asiatic species has a skin of a reddish or flesh tint, with black spines, while the general color of the larva of the native species is a dull gray, which, with black spines common to both, gives the latter a very much darker appearance. There are also certain minute structural characters which can be made out only with the use of the microscope. There is, furthermore, a very distinct difference in the habits of the two species, the Asiatic ladybird going through an indefinite number of generations—four or five annually, depending upon the climate and latitude—and the American species having much fewer

and often but a single generation annually. The slowness of breeding of the American species is a very great bar to its usefulness in the latitude which includes the principal deciduous-fruit interests of the United States.

These facts were thoroly demonstrated from the breeding records of the material sent from China and Japan. Several sendings were made by the writer, but unfortunately most of the specimens died in transit or during the first winter. Two individuals, however, survived, and during the first summer, that of 1902, from these two some 5,000 or more beetles were secured. The breeding was first carried

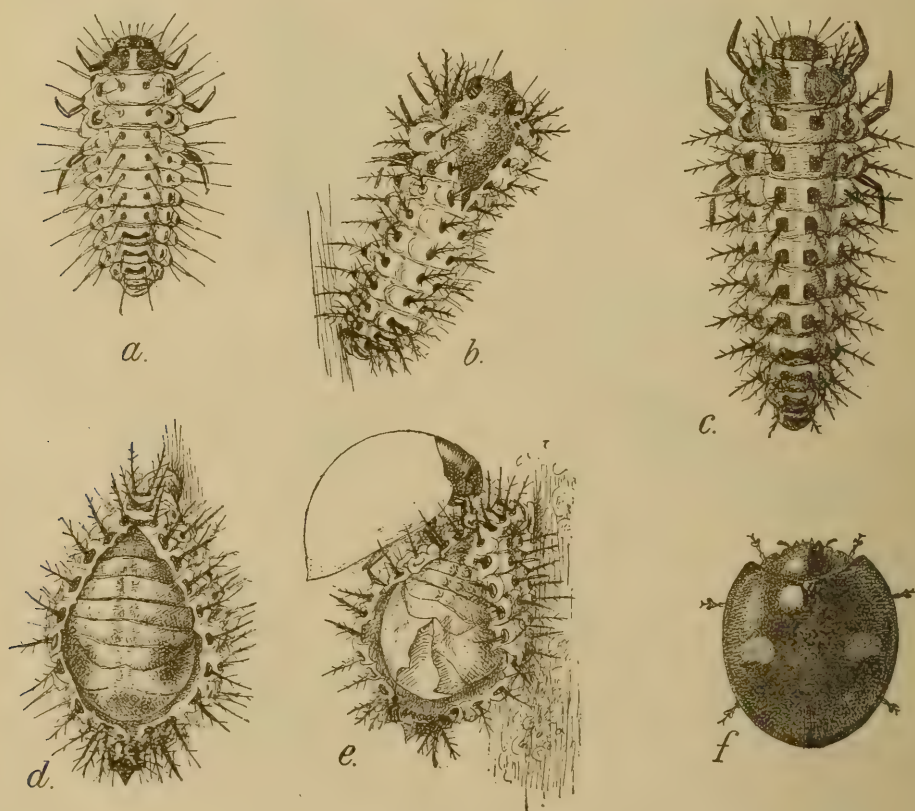
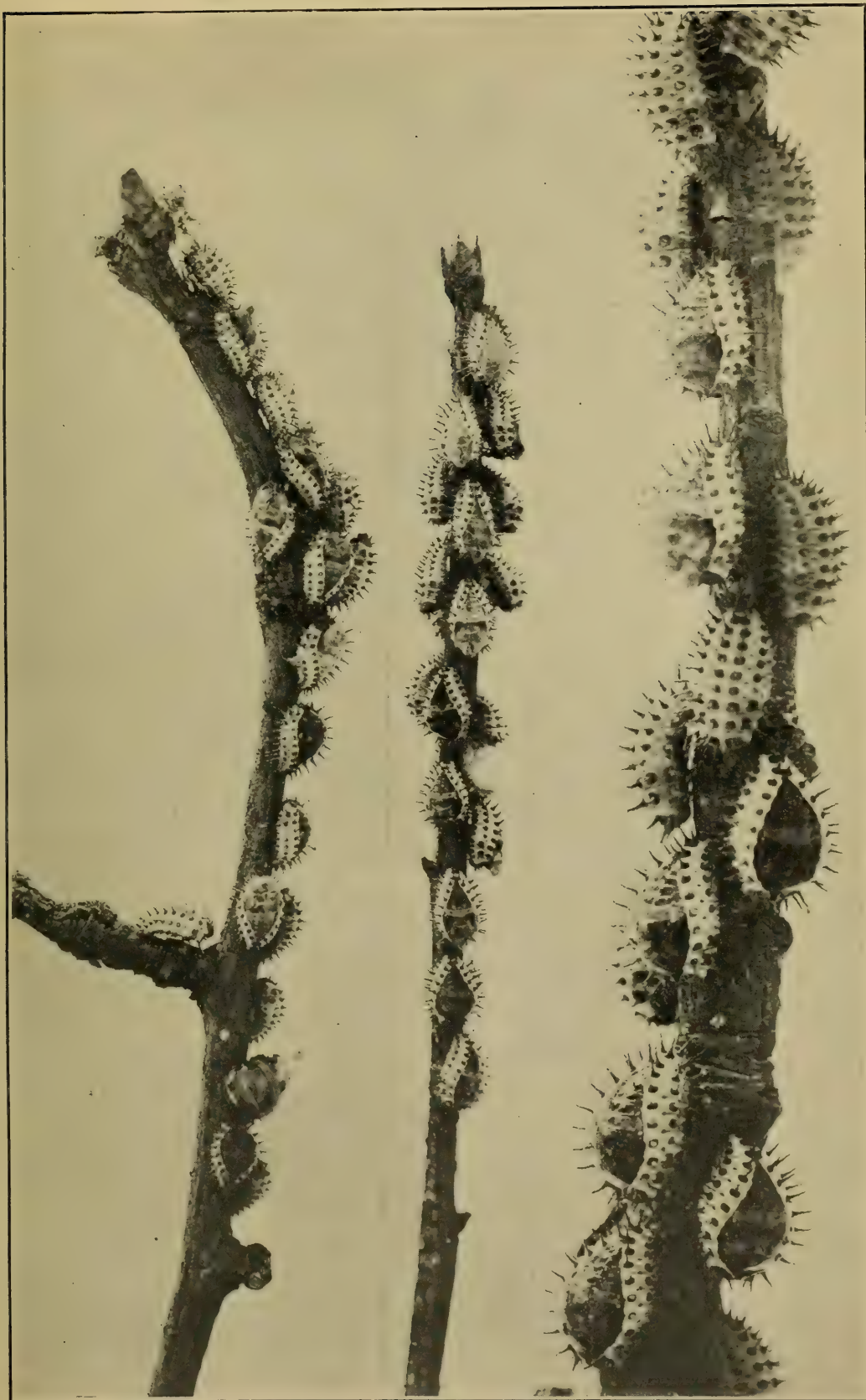


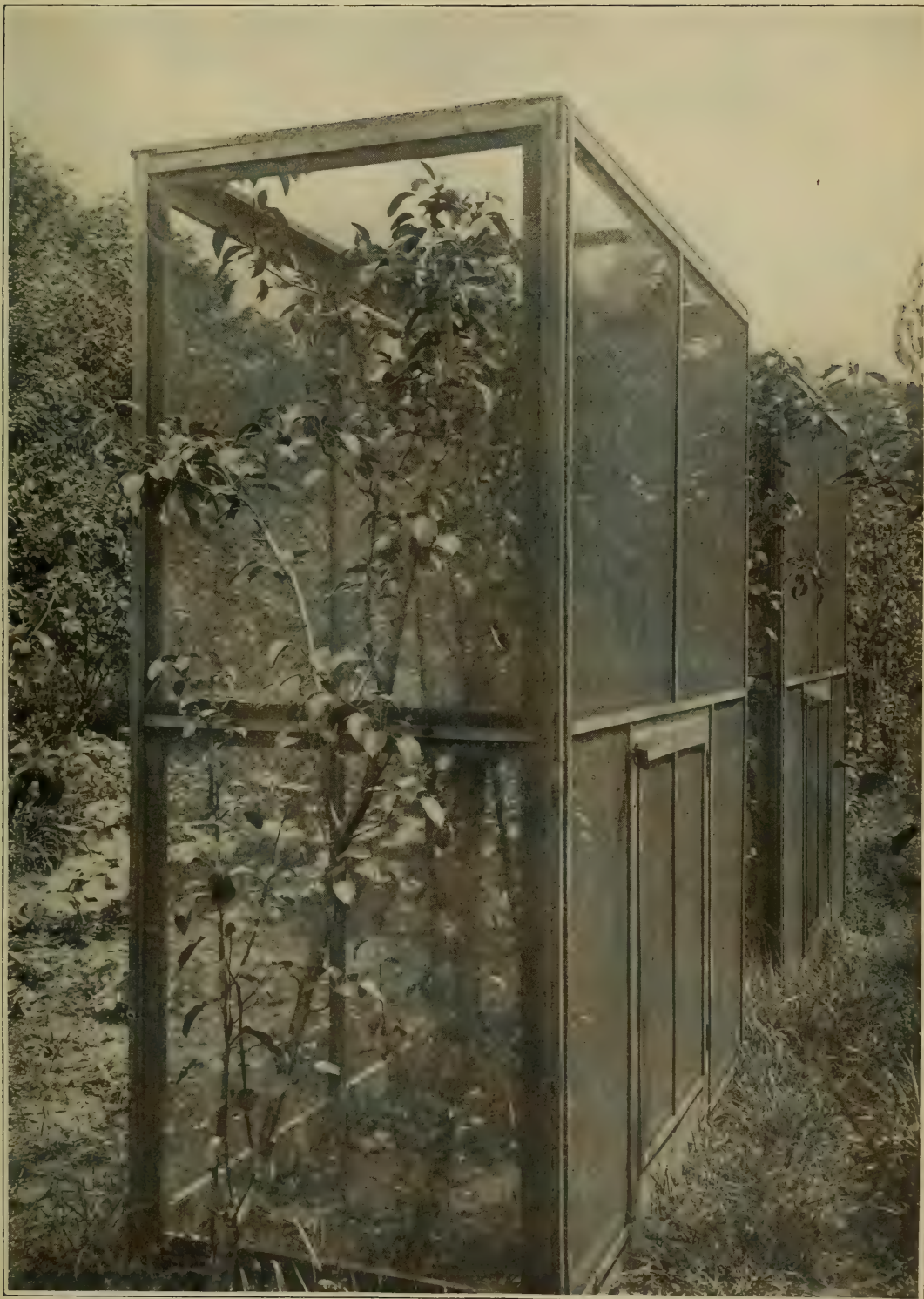
FIG. 12.—Asiatic ladybird (*Chilocorus similis*), later larval stages, pupa, and adult insect: *a*, second larval stage; *b*, cast skin of same; *c*, full-grown larva; *d*, method of pupation, the pupa being retained in split larval skin; *e*, newly emerged adult not yet colored; *f*, fully colored and perfect adult. All enlarged to the same scale (author's illustration).

on in cages (Pl. VIII), but afterwards the beetles were liberated in the small experimental orchard attached to the insectary of the Bureau.

A good many colonies were sent out to different States, both north and south, in the summer of 1902, many more in the summer of 1903, and a few additional colonies in 1904. Many of these colonies were liberated under rather unfavorable conditions, or, in other words, where there were very few infested trees, and the beetles probably became scattered and lost. The best success came with certain colonies sent to Georgia, and especially the notable case of the colony at Marshallville. This last was in an orchard containing some 17,000



PUPATING LARVÆ OF *CHILOCORUS SIMILIS* ON THE TERMINALS OF TWIGS IN
DEPARTMENT ORCHARD. (AUTHOR'S ILLUSTRATION.)



CAGES USED IN BREEDING ASIATIC LADYBIRD (*CHILOCORUS SIMILIS*).
(AUTHOR'S ILLUSTRATION.)

peach trees, covering about 75 acres, and adjoined a very much larger orchard belonging to the same owner, containing 250,000 trees. The ladybirds were liberated in August, 1902, in the smaller orchard. An examination of this orchard in July, 1903, indicated that the beetles were rapidly spreading, and that they would soon cover the smaller orchard. An estimate at this time of the number of ladybirds in all stages placed the total at somewhere between 25,000 and 40,000, and from observations breeding evidently continued at this point up to January. There was therefore in this latitude at least a very flattering outlook for good results from the imported beetle.

None of the colonies sent to northern States, that is, north of the District of Columbia, became established nor gave any useful results, and subsequent experience, and particularly the elaborate tests conducted by Dr. J. B. Smith, in New Jersey, would indicate that there is very little likelihood of usefulness from this beetle for northern fruit regions. That it may be established in the South was fully demonstrated by the experience noted in Georgia and by the experience in the orchard attached to the insectary of this Bureau, and in some other similar experiments where the results were perhaps less marked.

At the time that this beetle began to demonstrate its probable considerable usefulness in Georgia and elsewhere in the South, the practical value of the lime, sulfur, and salt wash became fully established, and all commercial orchards were regularly subjected to spraying operations with this mixture. The result was that the scale food of the imported beetle was almost completely destroyed, and this was true in the principal orchards where it was doing its best work. As a consequence all of the beetles starved or their numbers were greatly reduced.

The local stock of ladybirds in Washington practically disappeared with the gradual extermination of the scale food, and by the action of a native parasite which began to attack it after the first year. This parasite is one that we had previously reared from native ladybirds and had supposed it to be a secondary parasite; but the fact that it is a primary parasite became fully demonstrated, and it attacked the Washington colony with such vigor as to practically exterminate it. Fortunately this same parasite does not seem to have been equally active in the case of the southern colonies, but it will undoubtedly always be a bar to great usefulness from this and allied ladybirds.^a

A very serious difficulty in the introduction and establishment of a predaceous insect like this Asiatic ladybird beetle, which has rather limited powers of flight and is not carried about on nursery stock as are true parasites, is the very scattering nature of infestation in this country. In spite of the fact that the San Jose scale has become so

^aSee Proc. Ent. Soc. Washington, Vol. V, No. 2, pp. 138, 139, 1903.

widely distributed and is doing so much damage to orchards, it is still far from being universally present, and occurs after all in a very scattering way in orchards here and there, with often 20 or 30 miles between places of infestation. In Japan and China, where the Chilocorus occurs rather generally, it finds food for itself in every country and city dooryard, either the San Jose scale, or, in Japan particularly, the white peach scale (*Diaspis pentagona*), on which it also feeds. The stock of ladybirds, therefore, is always kept up in greater or less numbers, ready to take hold of any unusual scale increase. In this country, if the local food supply is stopt by spraying operations or exhaustion, the ladybird necessarily dies, and very rarely will go far enough to find another infested orchard and a new food supply. Ultimately, when the San Jose scale occurs everywhere, predaceous ladybirds like the Asiatic species will undoubtedly become much more useful than they are under present conditions.

Neither the Asiatic ladybird nor any other predaceous insect—and this is true also of the chalcidid parasites, tho perhaps in a less degree—can ever be expected to so thoroly exterminate the San Jose scale as to give sufficient protection for commercial orchard purposes, where absolutely clean or unspotted fruit is an essential. Predaceous and parasitic insects can only survive in connection with their host species, and therefore ultimately there must be a natural balance which will fluctuate from year to year or period to period, in which alternately the parasite and the host insect get the upper hand, but both necessarily being continuously present. Where substantially clean fruit must be had, as for shipping and export purposes, spraying or some other direct means of control must be practised; and now that an inexpensive tree wash for the San Jose scale has been discovered, it is very much to the advantage of everyone to spray regularly, rather than trust to control by natural enemies.

The importation of the Asiatic ladybird and the action of other predaceous enemies and of parasites can not, however, work anything but good. These feed upon or parasitize and destroy scale insects and will ultimately greatly reduce the virulence of the attacks of the San Jose species. The larva of the Asiatic ladybird was observed to eat the young of the San Jose scale at the rate of five or six insects to the minute, and even on an average of but one a minute a total of 1,440 scale insects per day would be destroyed. The appetite of these larvæ seems to be never satisfied, and they are eating practically all of the time. The adults also feed actively on the scale. In addition to their greater or less efficiency in generally checking the rapid multiplication of the San Jose scale, they and other natural enemies will ultimately be of special service in the control of the scale in private grounds and in small orchards and gardens the owners of which would not, under ordinary circumstances, practise regular spraying operations.

It is evident, from the records of true parasites given at the outset, that native parasites are beginning more and more to attack the San Jose scale. The native predaceous beetles will follow suit, and undoubtedly as years go on the seriousness of San Jose scale infestation will diminish, as, in fact, it has already done in California and perhaps noticeably also already in some sections in the East.

FUNGIOUS AND OTHER DISEASES OF THE SAN JOSE SCALE.

Scale insects are more or less subject to control by fungous and other diseases, and the San Jose species is no exception to this rule. Control by these agencies is particularly efficient in the moist Tropics, so much so that most scale insects are practically wanting in such regions. The armored scales, such as the San Jose scale, are rarely to be met with in tropical regions in any numbers, and where found are diseased in a large percentage of cases. The mealy bugs, however, are comparatively immune. The efficiency of these diseases as a means of control lessens as one leaves the Tropics, but in the subtropical regions of the United States, and even in the temperate regions, the San Jose scale has in many instances been very generally exterminated by disease. Several of these diseases are obscure and have never been scientifically studied, nor have they developed any fruiting stage so that they could be studied with any degree of accuracy.

In the early work with the San Jose scale in California, Mr. Coquillett reports the death of the San Jose scale from an unaccountable cause, supposedly disease, in Pasadena County, Cal., on pear trees which had not been treated with any kind of insecticide. Specimens of twigs covered with dead scales were submitted to the Bureau of Plant Industry for examination. No specific disease germ could be discovered, but this does not preclude the explanation of some definite disease as the cause of the death of the scales. Similar cases have come up in the East several times, the first perhaps occurring at Riverside, Md., in the early history of the scale, where, without treatment, the scale died in a very large percentage thruout a considerable orchard. A number of similar cases were reported by Doctor Howard in Bulletin 12, one from Tifton, Ga., where a careful count of the scales showed that on one twig out of 183 scales 4 were living; on a second, out of 723 scales 2 were living, and on a third, out of 579 scales 28 were living, giving 34 living scales out of 1,485, a mortality rate of 97.7 per cent. A similar case was reported also from Wadley, Ga., by Professor Starnes, and Professor Alwood has noted the same conditions at Vienna, Va. Doctor Howard also records the fungus-infested scale reported by Doctor Fletcher at Fruitland, Ontario, altho here the fungus or disease is probably a different one.

A more promising and important disease of the San Jose scale is the cosmopolitan scale-insect parasitic fungus *Sphærostilba coccophila*,

which Professor Rolfs, of the Florida experiment station, identified and discust at length in Bulletin 41 of that station, published in 1897. This disease is common to other species of scale insects, is widely distributed in Florida and elsewhere in the Southern States, and was found to attack the San Jose scale in Florida very efficiently.

As outlined by Professor Rolfs, a San Jose scale attacked by this fungus is usually transformed into a mass of mycelia before there is any external appearance of change. When the body of the insect has been consumed a bright, orange-colored protuberance forms at the base of the scale, or at times it breaks thru the protecting cover of the insect. This orange-colored protuberance is the most conspicuous part of the fungus and the only portion visible to the unaided eye. It varies in size from an eighth to a fortieth of an inch. Those that average about one-sixteenth of an inch are most abundant under favorable conditions. These protuberances are the spore-bearing bodies, and contain spores in great numbers. These orange-colored spore-bearing bodies are developed and mature within six weeks from the time of infection, and countless numbers of spores are liberated from them during rains and are washed down the trees and sometimes to the ground. Other and smaller spore bodies are eventually produced from the germination of these, and are carried about by the air or other means, and thus extend the infection. The biology of this fungus is rather technical and complicated, and need not be gone into in detail.^a

Professor Rolfs demonstrated experimentally that this fungus could be transferred from tree to tree artificially. His process was to inoculate acid bread with pure cultures of the fungus, and three weeks later to break up a piece of bread about an inch square in cold water, and apply to a scaly tree by means of a sponge or cloth or by spraying. The applications were made in midsummer, and the observations as to results late in February. Out of eight experiments four were successful, three unsuccessful, and one doubtful, the tree having in the meantime died. A good deal of interest was aroused by this publication of Professor Rolfs's, and experiments with this fungus were made in Georgia and by entomologists to whom cultures were distributed in the North and West. The results from these experiments in the more northern regions were not, as a rule, very satisfactory, and the fungus has not demonstrated great practical merit outside of Florida and perhaps southern Georgia. Undoubtedly, however, it is a very valuable aid in the control of the San Jose scale thruout the Gulf region, where high temperatures associated with sufficient humidity occur.

The most careful experimental work with this fungus was that conducted by Prof. J. B. Smith in New Jersey. While nearly all the

^a See Bul. No. 41, Florida Agric. Exp. Sta., 1897.

experiments made by Doctor Smith were barren of results, one yielded rather notable success. This was in the orchard of Mr. Horace Roberts, at Fellowship, N. J. Twigs from Florida bearing San Jose scales infested by the fungus were tied to branches of infested trees about the middle of June. Toward the end of September Doctor Smith found the fungus upon almost all of the trees upon which twigs had been tied. He reports that it had spread pretty well over the trees, and in some cases its presence was obvious from the surface of the ground to the extremity of the branches, hundreds of patches of the orange fruiting processes being everywhere noticeable. In no case, however, so far as Doctor Smith observed, had the disease spread to any adjacent trees, unless in a less visible stage, and by no means all of the scales on the trees containing these twigs were dead.

Various saprophytic fungi which develop in diseased or dying wood are sometimes so closely associated with the scale, or in fact grow on the scale as well as on the wood, that the inference is a very natural one that the scale is being killed by these fungi. Examples of two such fungi have recently been sent to us for examination and were submitted to the Laboratory of Plant Pathology of this Department for investigation. The following report indicates their nature:

We find two species of fungi present upon these specimens. The most conspicuous form is *Micropera cotoneastri* (Fr.) Sacc. The fungus forms small, black, somewhat pulvinate masses on the surface of the bark, sometimes covering old scales. The plant is not mature and shows in only a few instances pycnospores. It is not an uncommon fungus upon diseased or dying branches of fruit trees and other closely related rosaceous plants. Its relation to the scales present is probably always accidental. The fungus probably develops more readily upon the twigs which have been injured or partially killed by the scale.

There is also another fungus present in a considerable quantity on some of the twigs. It consists of minute black, slender stipitate bodies a few millimeters high. This is also immature, showing only conidia. It is probably *Spinetrina cerasi* B. & C. In the absence of the ascigerous form of the fungus it is impossible to state positively that this is the species. As in the case of the other fungus mentioned, it probably bears no parasitic relation to the scales present, as it usually occurs on dead or dying branches of fruit trees.

The first fungus mentioned (*Micropera*) is the one most closely associated with the scales.

The plan of using contagious insect diseases to destroy important pests, such as the San Jose scale, is a very attractive one, and in the case of the San Jose scale well worthy of more careful study than has so far been given it. It is possible that some of the obscure forms of disease which have already appeared in northern districts, as in Maryland, Virginia, and in the State of Washington, may be capable of artificial propagation and distribution, and yield results of distinct value in the control of the scale. All of these fungous and other diseases will undoubtedly become more efficient with the more wide and general distribution of the scale.

MEANS OF CONTROLLING THE SAN JOSE SCALE.**INSECTICIDE APPLICATIONS.**

Active experimentation with different remedies for the San Jose scale was instituted by this Office promptly after the discovery of the occurrence of this pest in eastern orchards and nurseries. A full record of these early experiments is given in Bulletin No. 3 (new series) of this Bureau, pages 56 to 71. The subject of these experiments will not be gone into in detail. They covered the use of the lime-sulfur washes employed against the San Jose scale in California, the hydrocyanic-acid-gas treatment for orchards and nursery stock, lye washes, pure kerosene, kerosene-soap emulsions, resin washes, and soap washes. The early experience with the lime, sulfur, and salt wash was unfavorable, largely due apparently to the fact that the observations on the trees treated were not continued long enough to note the effect of the late summer results. Good results were obtained with the kerosene emulsions, and particularly with the soap washes, and the fish-oil-soap wash became one of the standard means of controlling the scale and is still among the best and safest washes to be used, altho rather more expensive than necessary, except where only a few trees are to be treated.

The subject of remedies was promptly taken up by different experiment station entomologists in the East, and a vast body of experimental data is now on record in various station publications. The study of the subject of remedies has also been continued by this Bureau and reported in different bulletins. The lime, sulfur, and salt wash at first reported on adversely by us was afterwards demonstrated to be of real value, and experimental work was taken up, first by the Illinois Experiment Station, under Professor Forbes, and subsequently by other stations, and it has now come to be the generally accepted remedy for the San Jose scale. Without going at all in detail into the subject historically, it is sufficient for the purpose of this bulletin to reproduce the recommendations for the control of the San Jose scale substantially as given in the fourth revised edition of our Circular 42.

In addition to the standard remedies mentioned below a great many proprietary substances have appeared, and some of these have some merit. The best of these are certain merchantable brands of lime-sulfur compounds, and oils which have been treated by some secret process to render them miscible in water. The predominating constituent of the latter is mineral oil, and the resulting mixture, which is not apparently an emulsion, is undoubtedly of value if used in sufficient strength to get the required amount of oil on the trees. There is no advantage in using any of these compounds over the standard insecticides, and their greater cost is a distinct objection, together

with the uncertainty of composition. Nevertheless, where only a few trees are to be sprayed and the owners would probably not go to the trouble of preparing a standard emulsion or the lime-sulfur wash, the use of miscible oils or ready-made lime-sulfur washes is a good deal better than nothing, and may give very good results. Space does not permit the mention and discussion of a number of other mixtures which have not proven satisfactory nor the equal of standard means of control. Some of these have been experimented with somewhat extensively by different experiment station entomologists. .

The methods of control which have been especially followed in the Eastern States are (1) the lime-sulfur wash, (2) the soap treatment, (3) treatment with pure kerosene, (4) treatment with crude petroleum, (5) treatment with mechanical mixtures of either of the last two oils with water, and (6) petroleum emulsion with soap. All of these methods have proved themselves to be successful against the San Jose scale when properly carried out. As compared with the lime-sulfur wash, the others mentioned are more expensive, and the two oils, unless very carefully applied, are likely to injure the treated plants and are now seldom used. One's choice of method must therefore be governed by availability, special needs, and experience. In the main these remedies, including the lime-sulfur wash, are winter treatments and may be employed at any time when the trees are in dormant, leafless condition. The weaker oil-water mixtures and the emulsions may, however, be used in the growing season. The treatments enumerated are all for trees in the orchard. Nursery stock badly enough infested to require such treatment is best destroyed. For the general disinfection of nursery stock the hydrocyanic-acid-gas treatment is the standard and only satisfactory means.

THE LIME-SULFUR WASH.

In California, where this scale insect first occurred, the standard remedy for it is the lime, sulfur, and salt wash, a mixture formerly used as a sheep dip in Australia and employed with little change against the San Jose scale, and by a lucky chance proving effective. This wash was naturally first thought of on the discovery of the San Jose scale in eastern orchards. The earlier tests, however, conducted by this office in 1894, were unfavorable, and the experimentation which followed resulted in the demonstration by ourselves and others of several distinct and valuable methods of control noted below. Later studies of the action of this wash in California led the writer in 1900 to give it a further careful trial in the East, with most successful results, demonstrating that with favoring conditions, i. e., absence of dashing rains for a few days subsequent to the application, it would give just as good results in the Eastern States as on the Pacific coast.

A year later (1901-2) very elaborate tests conducted by Doctor Forbes in Illinois showed that fairly hard rains will not always invalidate spraying with this mixture. A vast amount of experience of the most practical kind since gained, contributed to by all the eastern experiment stations and by the big commercial fruit growers of the Middle and Eastern States, has fully demonstrated the practical merit of this wash and its superiority to others in point of safety to trees and in cheapness. The wash is furthermore a valuable fungicide and is notably useful against the peach leaf curl, sprayed trees being practically immune from this disease, so that the cost of treatment is often more than made good by the fungicidal benefit alone. Its disadvantages are the difficulty of preparation and the heavy wear which it entails on apparatus—objections, however, which do not offset its notable advantages, particularly for commercial orchard work or where the number of trees to be treated is sufficient to warrant the trouble of its preparation. It is, in fact, the standard spray now used in commercial orchards for the San Jose scale.

In the matter of composition of the wash scarcely any two experimenters agree. Salt was a part of the original composition of the sheep dip and has long been retained, with the idea that it added, perhaps, to the caustic qualities, and particularly to the adhesive nature of the wash. For the latter purpose a very small amount only, 1 or 2 pounds to the bushel of lime, need be added, following the custom in the preparation of whitewash mixtures. In practical experience, however, the salt seems to have been of very little benefit and is therefore omitted in the formula now given. The proportion of lime and sulfur is a matter of some indifference. The mixture obtained is sulphide of lime, and if an excess of lime is used it simply remains undissolved in the mixture and adds to the whitewashing character of the application. Too much lime is distinctly objectionable, however, because of the greater difficulty of spraying and harder wear on the pump and nozzles. The formula here given is substantially the one which has been hitherto recommended by this Bureau, reduced to the 45 or 50 gallon basis, or the capacity of the ordinary kerosene barrel commonly used in its preparation by the steam method.

Unslaked lime	pounds..	20
Flowers (or flour) of sulfur.....	do.....	15
Water to make	gallons..	45 to 50

The flour of sulfur, although requiring somewhat longer cooking, seems to make as good a wash as the flowers of sulfur, but an hour of thoro cooking is ample for either. Good quality stone lime should be secured and slaked in a small quantity of hot water in the cooking vessel, say one-third the full dilution. The sulfur, previously mixt up into a stiff paste, should be added at once to the slaking lime. The



STEAM PLANTS FOR COOKING LIME-SULFUR WASH.

(From Quaintance.)

whole mixture should be boiled for at least one hour, either in an iron kettle over a fire out of doors or in barrels by steam (see Pl. IX). Prolonged boiling increases the percentage of the higher sulphides, but the practical end is obtained with a boiling of the time indicated. In the process of making, the color changes from yellow to the clear brown of sulphide of lime, except for the excess of lime floating in it. After an hour's boiling the full quantity of cold water can be added, and the mixture should then be promptly applied in order to get its full strength before the higher sulphides are lost by cooling and crystallizing out. In transferring to the spray tank it should be past thru an iron screen or strainer, and the tank itself should be provided with an effective agitator.

The wash is a winter application and can not be applied to trees in leaf. It may be applied at any time after the falling of foliage in early winter and prior to the swelling of the buds in spring. It will probably be necessary also to make this application every year, or at least as often as the San Jose scale develops in any numbers. The wash kills the San Jose scale not only by direct caustic action, but apparently also by reason of the coating on the trees, which remains in evidence until midsummer or later, and may kill or prevent the settling of any young scale insects which may come from parents escaping the winter action.

Two applications may be given badly infested orchards—one in late fall, the other in late spring. Where but one application is given, the late spring just before the buds open is the best time.

The wear on pumps and nozzles can be kept to a minimum by carefully washing the apparatus promptly after use. The Vermorel nozzle is the best one for the wash, and additional caps may be secured to replace worn ones. The use of an air or other gas pressure pump instead of the ordinary liquid pump will save the wear of the lime on the pump. In spraying with this wash clothing is ruined, and only the oldest garments should be worn. Care should be taken also to protect the eyes to avoid unnecessary inflammation.

THE SOAP TREATMENT.

Whale-oil or fish-oil soap, preferably made with potash lye, is dissolved in water by boiling at the rate of 2 pounds of soap to the gallon of water. If applied hot and on a comparatively warm day in winter, it can be easily put on trees with an ordinary spray pump. On a very cold day, or with a cold solution, the mixture will clog the pump, and difficulty will be experienced in getting it on the trees. Trees should be thoroly coated with this soap wash. Pear trees and apple trees may be sprayed at any time during the winter. Peach trees and plum trees are best sprayed in the spring, shortly before the buds swell.

If sprayed in midwinter or earlier, the soap solution seems to prevent the development of the fruit buds, and a loss of fruit for one year is apt to be experienced, the trees leafing out and growing, however, perhaps more vigorously on this account. The soap treatment is perfectly safe for all kinds of trees and is very effective against the scale. With large trees or badly infested trees, preliminary to treatment it is desirable, with this as well as other applications, to prune them back very rigorously. This results in an economy of spray and makes much more thoro and effective work possible. The soap can be secured in large quantities at from $3\frac{1}{2}$ cents to 4 cents a pound, making the mixture cost, as applied to the trees, from 7 cents to 8 cents a gallon. The success of the soap treatment is largely influenced by the quality of the soap used. Many brands are on the market, mostly made with soda lye. A potash soap should be insisted on, and one that does not contain more than 30 per cent of water. The soda soap washes are apt to be gelatinous when cold and difficult or impossible to spray except when kept at a very high temperature.

KEROSENE TREATMENT.

This consists in spraying the trees with ordinary illuminating oil (coal oil or kerosene). The application is made at any time during the winter, preferably in the latter part, and by means of a spray pump making a fine mist spray. The application should be made with the greatest care, merely enough spray being put on the plant to moisten the trunk and branches without causing the oil to flow down the trunk and collect about the base. With the use of this substance it must be constantly borne in mind that careless or excessive application of the oil will be very apt to kill the treated plant. The application should be made on a bright, dry day, so that the oil will evaporate as quickly as possible. On a moist, cloudy day the evaporation is slow, and injury to the plant is more apt to result. If the kerosene treatment be adopted, therefore, it must be with a full appreciation of the fact that the death of the tree may follow. This oil has been used, however, a great many times and very extensively without consequent injury of any kind. On the other hand, its careless use has frequently killed valuable trees. Its advantages are its effectiveness, its availability, and its cheapness, kerosene spreading very rapidly and much less of it being required to wet the tree than of a soap and water spray. Pure kerosene is more apt to be injurious to peach and plum than to pear and apple trees, and the treatment of the former, as with the soap wash, should be deferred until spring, just before the buds swell. With young trees especially it is well to mound up about the trunk a few inches of earth to catch the overflow of oil, removing the oil-soaked earth immediately after treatment.

THE CRUDE-PETROLEUM TREATMENT.

Crude petroleum is used in exactly the same way as is the common illuminating oil referred to above. Its advantage over kerosene is that, as it contains a very large percentage of the heavy oils, it does not penetrate the bark so readily, and, on the other hand, only the light oils evaporate, leaving a coating of the heavy oils on the bark, which remains in evidence for months and prevents any young scale which may come from the chance individuals that were not reached by the spray from getting a foothold. Crude petroleum comes in a great many different forms, depending upon the locality, the grade successfully experimented with in the work of this Bureau showing 43° Baumé. Crude oil showing a lower Baumé than 43° is unsafe, and more than 45° is unnecessarily high. The lower specific gravity indicated (43°) is substantially that of the refined product, the removal of the lighter oils in refining practically offsetting the removal of the paraffin and vaseline. The same cautions and warnings apply to the crude as to the refined oil.

THE OIL-WATER TREATMENT.

Various pump manufacturers have now placed on the market spraying machines which mechanically mix kerosene or crude petroleum with water in the act of spraying. The attempt is to regulate the proportion of kerosene so that any desired percentage of oil can be thrown out with the water and be broken up by the nozzle into a sort of emulsion. Some of these machines, when everything is in good working order, give fairly satisfactory results, but absolute reliability is far from assured.

The best outlook for good apparatus of this sort seems to be in carrying the oil and water in separate lines of hose to the nozzle, uniting them in the latter, and in maintaining an absolute equality of pressure on both the oil and the water tanks by employing compressed air as the motive force, kept up by an air pump, the air chamber communicating with both of the liquid receptacles. Any other source of constant pressure, as carbonic acid gas or steam, will answer. One or more manufacturers are now working on apparatus of this general description. A 10-per-cent strength kerosene can be used for a summer spray on trees where the San Jose scale is multiplying rapidly and where it is not desirable to let it go unchecked until the time for the winter treatment. The winter treatment with the water-kerosene sprays may be made at a strength of 20 per cent of the oil. Applications of the oil-water spray should be attended with the same precautions as with the pure oil, and there is even somewhat greater risk, owing to the natural tendency one has to apply the dilute mixture much more freely than the pure oil. The application should be merely

enough to wet the bark, and should not, to any extent, at least, run down the trunk. The collection of water and oil about the trunk is just as dangerous to the tree as is that of the pure oil.

In the use of the oil sprays noted above one who has not had experience with them is advised to make some careful preliminary tests to fully master the process, preferably waiting two or three weeks to determine the results before entering on the general treatment of the orchard. It is well, also, with the oil-water mixtures, to test the pump from time to time, spraying into a glass jar or bottle to determine by actual measurement whether the correct percentages of oil and water are being maintained.

PETROLEUM-SOAP EMULSIONS.

The kerosene-soap emulsion, following chiefly the Riley-Hubbard formula, has been one of the standard means against scale insects for twenty years. The distillate emulsion generally employed in California for spraying citrus trees, on which the lime, sulfur, and salt wash can not be used, is substantially the same thing, except that it is made with the California distillate or petroleum oil. Crude petroleum of any kind, as well as the refined product, may also be used in making this emulsion. The use of the soap emulsions against the San Jose scale in the East has not been very general, on account of the greater facility with which the pure oil or oil-water mixtures can be applied. The difficulty of obtaining uniform results with the latter has led to a return to the use of emulsions to some extent, and there can be no doubt about their superior merit when it is desired to dilute the pure oils. Emulsions may be applied at any strength with absolute confidence that there will be no variation. Where the emulsion can be prepared wholesale by steam power its employment is attended with no difficulties. In California it is prepared by oil companies and sold at very slightly more than the cost of the oil and soap ingredients. It is made after the following formula:

Petroleum.....	gallons..	2
Whale-oil soap (or 1 quart soft soap).....	pound..	$\frac{1}{2}$
Water (soft).....	gallon..	1

The soap, first finely divided, is dissolved in the water by boiling and immediately added boiling hot, away from the fire, to the oil. The whole mixture is then agitated violently while hot by being pumped back upon itself with a force pump and direct-discharge nozzle throwing a strong stream, preferably one-eighth inch in diameter. After from three to five minutes' pumping the emulsion should be perfect, and the mixture will have increased from one-third to one-half in bulk and assumed the consistency of cream. Well made, the emulsion will keep indefinitely and should be diluted only as wanted for use.

In limestone regions, or where the water is very hard, some of the soap will combine with the lime or magnesia in the water, and more or less of the oil will be freed, especially when the emulsion is diluted. Before use such water should be broken with lye, or rain water should be employed.

For winter sprays dilute the emulsion with either 3, 4, or 5 parts of water, giving a percentage of oil of approximately 17, 13, and 11 per cent. The strength in oil of this application on trees as compared with the oil-water sprays is the equivalent of 25, 20, and 15 per cent oil, because relatively more of the heavier oil-soap emulsion is held by the bark. The two stronger mixtures may be used on the apple and pear and the weaker one on peach and plum.

For summer applications dilute with 7, 10, or 15 parts of water, giving approximately 8, 6, and 4 per cent of oil. The weaker strengths may be used on trees with tender foliage, such as that of peach, and the greater strength for strong foliage plants, like the apple and pear.

FUMIGATION OF NURSERY STOCK.

All nursery stock which is under the least suspicion of contamination with the San Jose scale should be fumigated; and it is perhaps worth while to fumigate in any case to give the utmost assurance of safety to the purchaser. The hydrocyanic-acid-gas fumigation is the one to use. This gas is generated by combining potassium cyanide, sulfuric acid, and water. The proportions of the chemicals are as follows: Refined potassium cyanide (98 per cent), 1 ounce; commercial sulfuric acid, 1 ounce; water, 3 fluid ounces—to every 100 cubic feet of space in the fumigating room or house. The latter should be as nearly airtight as possible and provided with means of ventilation above and at the side, operated from without, so that at the end of the treatment the poisonous gases can be allowed to escape without the necessity of anyone entering the chamber. The generator of the gas may be any glazed earthenware vessel of 1 or 2 gallons capacity, and should be placed on the floor of the fumigating room and the water and acid necessary to generate the gas added to it. The cyanide should be added last, preferably in lumps the size of a walnut. Promptly after adding the cyanide the room should be vacated and the door made fast. The treatment should continue forty minutes. It must be borne in mind that the gas is extremely poisonous and must under no circumstances be inhaled. The gas treatment is effective against the scale on growing trees in the orchard also; but the difficulty and expense of the treatment, except for nursery stock, make it prohibitive in the case of deciduous fruits.

LEGISLATION AGAINST THE SAN JOSE SCALE.

As indicated in another place, no insect has been the subject of so much domestic and foreign legislation as has the San Jose scale. In this country nearly all the States have past laws regulating the sale and shipment of nursery stock and providing for inspection on account of this scale insect, and a great many foreign countries have made regulations regarding the importation of American plants and fruits.

The domestic legislation on insect matters, including the San Jose scale, was compiled by Doctor Howard and published as Bulletin No. 13 (new series) of this Office in 1898, and the foreign legislation up to 1900 is summarized by Doctor Howard in Circular No. 41 of this Office, published in August, 1900. There has been a great deal of additional legislation by different States subsequent to the publication of Bulletin No. 13, and by a resolution of the Association of Economic Entomologists and the American Association of Horticultural Inspectors this Office has collected, by the aid of special committees appointed by the two associations mentioned, all of the laws in their present form, and these have very recently been published as Bulletin No. 61 of the Bureau of Entomology. There have been also some changes in foreign legislation, and ultimately a revision of Circular 41 will be issued. The subject is much too large and bulky to be considered in this bulletin.

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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY—BULLETIN NO. 63, Part I.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

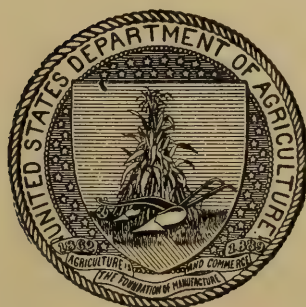
HIBERNATION AND DEVELOPMENT OF THE
COTTON BOLL WEEVIL.

BY

E. DWIGHT SANDERSON,

Formerly State Entomologist of Texas.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., September 15, 1906.

SIR: I have the honor to transmit herewith the manuscript of a contribution by Prof. E. Dwight Sanderson on the hibernation and development of the cotton boll weevil. This paper embodies the results of a large amount of work carried on by Professor Sanderson while State entomologist of Texas, and was written by him in the fall of 1904. In view of its practical bearing and the fact that much of the data it contains is new, I recommend its publication as Part I of Bulletin No. 63 of this Bureau, the bulletin as a whole to be entitled "Papers on the Cotton Boll Weevil and Related and Associated Insects," and to be made up of separate papers by various persons engaged in cotton boll weevil investigations.

Respectfully,

F. H. CHITTENDEN,
Acting Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

HIBERNATION AND DEVELOPMENT OF THE COTTON BOLL WEEVIL.

By E. DWIGHT SANDERSON,
Formerly State Entomologist of Texas.

INTRODUCTION.

The most economical method of controlling the boll weevil is to destroy its food supply by burning or grazing the green cotton stalks in the fall before frost occurs, so as to reduce by starvation the numbers which go into hibernation. As it is known that a large proportion of weevils die during hibernation it may be readily understood that a much greater degree of benefit may be derived by destroying the weevils in the fall than by attempting to destroy them in the spring. The time at which the weevils enter hibernation, the numbers which attempt to hibernate, the mortality occurring during the winter and the factors which influence this mortality, and the time of emergence in the spring are, therefore, matters of practical importance upon which we have made careful observations.

HIBERNATION.

DATE OF ENTERING HIBERNATION.

Table I gives a summary of eight lots of weevils which were confined in cages at different dates during October and November, 1903. Altogether some 1,300 weevils were used in these experiments. Beginning with October 7 one cage was started each week until November 17. On November 18 a sharp-freeze occurred, and almost immediately thereafter all weevils went into hibernation. It will be seen that in lots 1, 2, and 3 all of the weevils died prior to November 18. During the beginning of these experiments a plentiful supply of squares was furnished the weevils for food, but as they showed an inclination toward hibernating about the third week in October this supply was discontinued. In all cases the weevils which hibernated successfully

did not begin hibernation until about November 17 or 18. This was also true of other weevils under observation in the laboratory. The daily notes concerning one or two of the outdoor cages started in October are of interest in this connection. For example, lot 3 comprized 100 weevils put in hibernation cage with food October 16. The hibernation cages were wooden boxes 2 feet high and 1 foot square, with the sides about one-half open and covered with wire window screening, except the front, which was of glass. In the bottom of each cage was placed plenty of rubbish, consisting of fallen cotton leaves, rotten wood, etc. The weevils were thus exposed to the outside temperature, but were largely protected from rain. These cages were placed in various situations in a small grove and pasture at the apiary of the Agricultural and Mechanical College, College Station, Tex. The records kept of this lot and of lot 2 are as follows:

October 17, 18, no hibernation, weevils active; October 19, same, quiet in bottom of cage; October 21, sign of hibernation evident, some weevils congregate about dead rubbish on floor of cage; October 22, 23, 24, similar conditions, some seem to be hibernating; October 25, a few more in hibernating attitude; October 26, weevils are undoubtedly hibernating, shown by dormant attitude under rubbish; October 27, about all hibernating—if they were let out they would not hibernate, as some were let out, and they joined those in the field and commenced feeding; October 29, hot day arouses weevils to activity; October 30, think weevils die at the rate of 1 to 4 per day.

November 2, warm weather makes them exceedingly active; this continues until the 8th, when cool weather checks their activity; November 15, all weevils dead.

Lot 2.—One hundred weevils placed in cage October 8 and fed with squares; October 9, weevils lively, flying about in cage; October 10, 11, no signs of hibernation; October 12, less active; October 13, those on rubbish dead or dying; October 14, no signs of hibernation; October 18–23, weevils active, no hibernation; October 25, all but 8 dead, those hibernating under rubbish; October 29, weevils active; October 29–31, November 1, 2, sluggish; November 5, all dead.

TABLE I.—Percentage of mortality of hibernating weevils.

Lot.	Date placed in cage.	Number of weevils.	Date hibernated.	To November 18, 1903.			November 18-30, 1903.			December, 1903.					Died in December.
				Date.	Alive.	Dead.	Date.	Alive.	Dead.	Date.	Alive.	Dead.	Missing.	Total December 1.	
	1903.				Per ct.	Per ct.		Per ct.	Per ct.		Per ct.	Per ct.		Per ct.	Per ct.
1	October 7	100		Nov. 1		100.0									
a 2	October 8	100		Oct. 24											
				Oct. 25		92.0									
				Nov. 3		99.0									
				Nov. 5		100.0									
a 3	October 16	100		Oct. 30	(b)										
				Nov. 15		100.0									
4	October 23	100	Nov. 18	Nov. 18	100.0					14	7	71	22	71	71
5	October 25	300	do			9.0				4	67	33	}	82	71
a 6	November 1	200	do		50.0	50.0	23	50	50	27	14	61		25	61	11+
7	November 9	200	do	Nov. 15	93.5	6.5									
8	November 17	200	do				25		100						
5+7	Average	500	do			8.0									
4, 5, 6	Average	600	do			21.0								75	51+

a Furnished with squares for food.

b One to 4 dying per day.

TABLE I.—*Percentage of mortality of hibernating weevils—Continued.*

Lot.	Date placed in cage.	Number of weevils.	Date hibernated.	February, 1904.			March, 1904.			Total survived.	Date active.
				Date.	Alive.	Dead.	Date.	Alive.	Dead.		
	1903.				<i>Per ct.</i>	<i>Per ct.</i>		<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	
1	October 7.....	100	.....	.....	.....	.....	.....	.....	.....	.....	
2	October 8.....	100	.....	.....	.....	.....	.....	.....	.....	.....	
3	October 16.....	100	.....	.....	.....	.....	.....	.....	.....	.....	
4	October 23.....	100	Nov. 18	(b)	.....	.....	.....	.....	.....	.....	
5	October 25.....	300	do.....	2	7.3	91.6	22	5.6	94.4	5.6	Mar. 22
6	November 1.....	200	do.....	(b)	.....	.....	.....	.....	.....	.....	
7	November 9.....	200	do.....	.....	.....	.....	21	10.5	89.5	.....	Mar. 18
8	November 17.....	200	do.....	.....	.....	.....	24	7.0	93.0	7.0	
5+7	Average.....	500	do.....	.....	.....	.....	.....	.....	.....	6.2	
4, 5, 6	Average.....	600	do.....	.....	.....	.....	.....	.....	.....	.....	

a Furnished with squares for food.*b* Accidentally disturbed and discontinued.

It will be seen from these experiments that weevils can not be forced into hibernation before the temperature declines to that point at which they normally hibernate, and that if deprived of food or confined much before that time most of them will die. The first weevils to go into hibernation were those of lot 4, placed in cages on October 23, but these did not actually hibernate until November 18. The case of lot 8, of 200 weevils placed in a cage November 17, in which all died by November 25, is difficult to explain. Our notes upon the condition of the weevils in the fields during the same fall show practically the same conditions as those existing in the cages. The very careful record by Mr. A. F. Conradi, made in fields in the neighborhood of the college, is briefly as follows:

September 6, 7, abundant, very few perfect squares, dry weather; September 8, 9, abundant, mating pairs common; September 10, abundant, practically all squares punctured, mating pairs less common; September 11, 12, less numerous, fewer mating pairs, few perfect squares; September 13, less abundant, perfect squares more common, mating pairs scarce; September 14, 15, less abundant, perfect squares more common; September 16–18, fewer weevils, perfect squares more common; September 19, less destructive than at any time since the 10th, perfect squares abundant; September 20–28, similar conditions; September 29, 30, conditions growing worse, more weevils, fewer perfect squares; October 5, numerous, eating vigorously; October 10, exceedingly abundant and destructive, a few dozen perfect squares found with great difficulty, smallest squares often punctured in several places; October 11, abundant, several on plants near field, one in door yard on house, mating common; October 12, 13, abundant, few mating, few perfect squares; October 14, many weevils found clustering about the base of bolls of all sizes just inside of the involucre, no signs of hibernation; October 16, 100 weevils found on 95 plants in thirty minutes; October 18, 19, weevils more sluggish, unusual numbers congregate behind involucre of larger squares; October 20, the size of weevils is exceedingly variable, more so than at other seasons, general depression in activity; October 22, some adults mating, no signs of hibernating; October 23–26, less numerous, no mating pairs, weather cool, beetles seem to be leaving; November 2, abundant in certain localities in the field; on 5 plants they average one to a square, then for a dozen or more none are found; mating common, but little egg laying for several days.

October 3, weather warm, weevils that had assumed a hibernating attitude lively again, mating pairs and oviposition common; October 4, much more active, mating pairs and number of eggs increasing, collected 100 weevils from 132 stalks; October 6, conditions similar to middle of September, collected 50 weevils from 46 stalks; October 7, weevils numerous, mating common, more egg punctures, collected 100 weevils from 92 stalks and 67 from 80 stalks; October 9, at apiary, 100 weevils on 98 stalks at east end, 50 on 100 stalks, west end, 48 on 90 stalks at the middle of the field; October 11, 90 weevils on 176 stalks; October 13, average of 1 weevil to 2

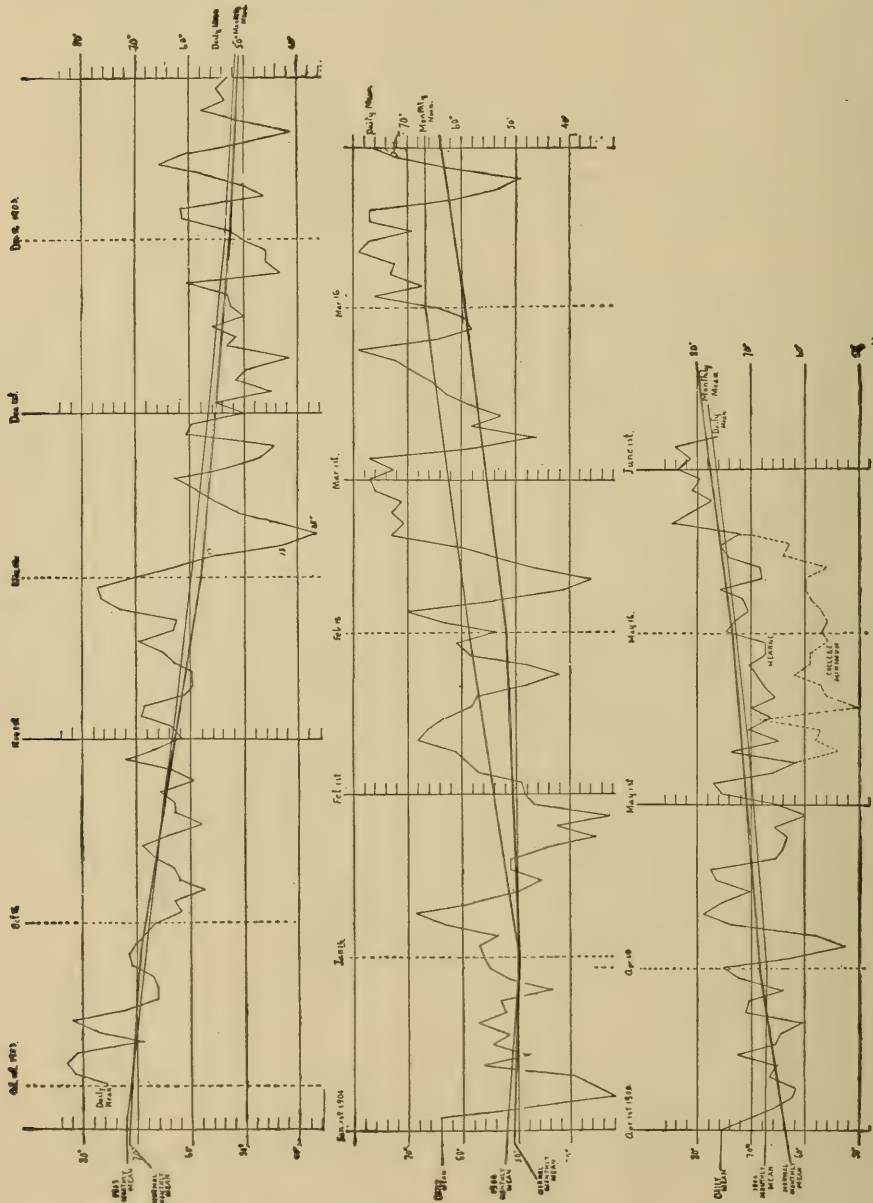


FIG. 1.—Daily temperatures at College Station, Tex., October 1, 1903, to June 15, 1904.

stalks; October 15, 16, weevils active, eggs common; October 17-21, low temperature, with sharp freeze on the night of the 18th, when the cotton froze and the supply of food was exhausted; October 22, after the 18th weevils went into hibernation rapidly, but diminution not markedly noticed until the 22d, when there was but 1 to 10 stalks.

The weevils were not injured by the freeze of the 18th, as many were found in the field on the 19th. By referring to figure 1, giving

the daily temperature,^a it will be seen that the activity of the weevils corresponds very closely with the rise and fall in temperature. Hunter and Hinds^b state that hibernation will commence as the mean average temperature falls to between 55° and 60° F., which our observations of last fall corroborate. They also state that at Victoria hibernation will normally commence about December 1. By referring to figure 2 it will be seen that the normal temperature at Victoria drops to 60° at about December 1 and at College Station from November 10 to 15. At Dallas hibernation would be several days earlier and for northeastern Texas generally about November 1 to 10. From the observations available, therefore, it would seem safe to assert that hibernation will usually occur when the mean average temperature drops below 60° F.

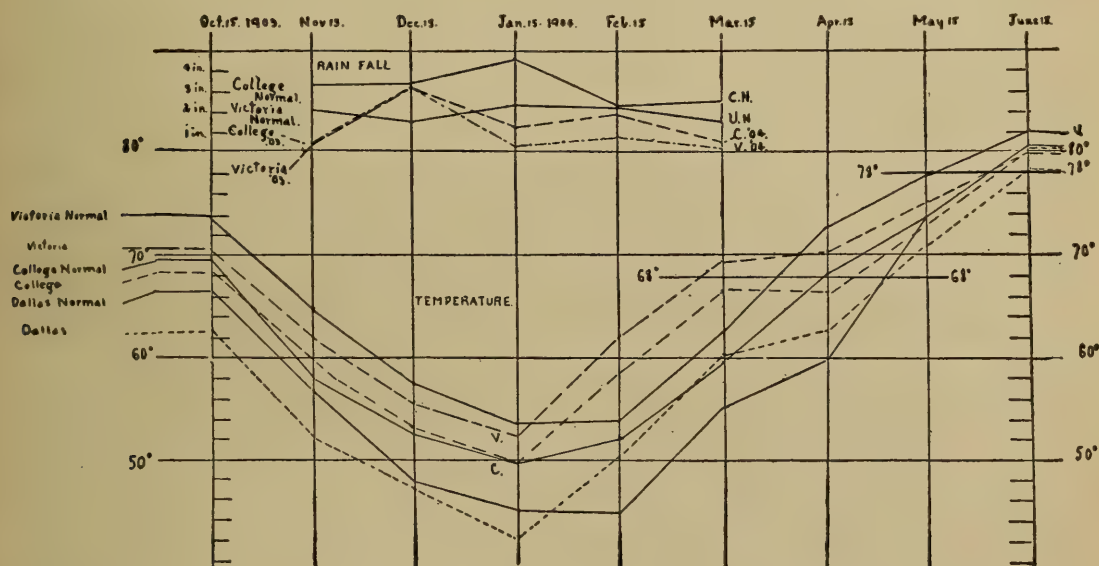


FIG. 2.—Rainfall and temperature records for College Station and Victoria in 1903-4 compared with normals.

NUMBER OF WEEVILS ENTERING HIBERNATION.

The number of weevils found in an infested field in the fall at about the time hibernation would normally begin is governed largely by the food supply and is influenced also by the temperature and rainfall during September and October.

^a Concerning the method of plotting the curves it should be stated that the vertical lines upon which the nodes of the curve occur are marked as being the 15th of the month. The mean temperature as given by the Weather Bureau is reported at the end of each month. If we should consider the node of the curve as occurring at the end of the month, we would misrepresent the facts, as during the spring and fall the temperature is on a gradual rise or decline. Consequently if the mean monthly temperature is given for the 15th of the month, the exact temperature for dates between these nodes can be more correctly ascertained from the curve. This applies also to the figures showing rainfall.

^b Bul. 45, Div. Ent., U. S. Dept. Agric., p. 81.

If during September and early October there should be a normal or excessive rainfall and the plants keep growing, there will be plenty of squares upon which the weevils may breed and multiply until frost occurs. If, on the other hand, during this period the weather should be hot and dry, the plants will stop growing and those infested squares which fall to the ground will be quickly dried up and but a relatively small number of weevils will be produced. This was strikingly shown in observations upon the number of weevils on cotton at the college in the fall of 1903 as compared with the fall of 1904. During September, 1904, there was an average of not over 3 squares to a plant, whereas in September, 1903, there was an average of about 40 squares to a plant. At this time during these two seasons there was approximately the same number of weevils in the field; but it can be readily seen that with so few squares in which to breed, in September, 1904, there would be far fewer weevils developed after September to go into hibernation.

Mr. Louis Teltschick states that in Lavaca County, Tex., at the time he turned cattle in to graze his cotton, October 17, 1903, there were about 2 weevils to a stalk. Concerning this he writes as follows:

I will state in this connection that in my opinion the bulk of the weevils had then left the cotton. I think that during the last three years the majority of weevils began leaving the cotton as early as September 1. They were undoubtedly compelled to do this by a scarcity of squares. To be more explicit I give you the following figures: On August 28, 1904, I estimated the number of weevils in my field at 12 per stalk. While I made no such estimate in 1902 or 1903, considering the extent of the injury worked by them in those years, I think that their numbers on the same date might safely be put at 6 for 1902 and 9 for 1903. When I cut the stalks early in October, 1902, I found that there were about $1\frac{1}{2}$ weevils per stalk, and in October, 1903, when I turned the cattle in, there were about 2 weevils per stalk. You will see that according to these estimates from 75 to 80 per cent of the weevils infesting the fields on August 28 in those years had disappeared by October 15, leaving out of account all weevils hatched between the two dates. Where they went or what became of them I am unable to say. They may have gone to uninfested regions, or they may have died or gone into hibernation quarters when squares became too scarce to supply all of them.

These observations merely confirm our previous statement that the number of weevils in the fall is controlled entirely by the food supply.

One of the principal factors in cutting off the food supply of the boll weevil in the fall is the cotton leaf-worm or so-called "army worm" (*Alabama argillacea* Hbn.). Whereas this insect was formerly considered to be the great scourge of the cotton planter, it may now be said to be an almost positive advantage in territory affected by the boll weevil, as its injury does not ordinarily occur until after the crop has been made, and all further fruiting would be prevented by the boll weevil. As soon as the leaf worms have stripped the cotton of foliage and squares the weevils either die or leave for fields where they may obtain food. This was strikingly shown in an examination of four

plats at Smith & Carson's plantation on September 14, 1904. In plats 1-3, where the leaf worm had stript the plants clean of foliage, but 8 weevils were found to 100 stalks and but 40 per cent of the squares were punctured. On plat 4, immediately adjoining these plats, which had not been so seriously injured by the leaf worm, there were 27 squares to a plant, 148 weevils to 100 stalks, and 70 per cent of the squares were punctured.

Mr. Teltschick has given us some interesting observations upon the leaf worm, as follows:

As far back as I can remember—some twenty-odd years—the people here (Lavaca County) had to fight the leaf worm every year. Arsenic, Paris green, and London purple were used with varying success. At first the worms made their appearance as early as June and frequently hatched in such numbers as to enable them to sweep a field clean in less than 48 hours. Gradually, however, this wave of worms subsided; that is to say, they made their appearance later and later in the season, and became fewer in numbers, until finally when the boll weevil made its first appearance, their coming was no longer viewed with alarm. On the contrary they were often welcomed by the farmers, inasmuch as they cleared away the thick foliage of the cotton plant, thus often saving a considerable number of the bolls at the bottom, which would otherwise have rotted for the want of light and air.

At the time of the weevils coming here (seven or eight years ago) the worms were no longer regarded as a menace to the cotton crop; they made their first appearance then either late in August or early in September. They kept this up practically until in 1902 and 1903 they failed to come at all. This year (1904) they reappeared early in September and completely stript cotton of its foliage. The second destructive brood of worms is just now (October 2, 1904) hatched, and there is every reason to believe that they will keep the stalks bare until frost as they did in former years. It will have to be admitted that during 1902-3, when cotton grew and formed squares undisturbed up to the first frost, which occurred in December of both years, an opportunity was given the weevil to go into hibernating quarters later in the season and in greater numbers than would have been the case had the further growth of cotton been prevented either by man's or nature's means.

Thus the leaf worm accomplishes practically the same result as is obtained by grazing stalks with cattle and may be considered a most valuable ally.

The number of weevils which go into hibernation may of course be decreased by the thoro grazing of the cotton with cattle before frost, or by cutting, plowing out, and burning the stalks. It is safe to say that by a thoro fall clearing of the ground the number of weevils entering hibernation can be decreased at least 75 per cent. Weevils in all stages are thus immediately destroyed, and if the land is cleared of cotton a month before the normal hibernation period the weevils then escaping are almost certain to starve, as has been shown in Table I, before it becomes cold enough for them to hibernate.

Under normal conditions, as noted in Table III, column 3, the number of weevils to a stalk at the time of hibernation will vary from 1 for every 2 stalks to 2 for each stalk in badly infested fields, the number depending, as before stated, entirely on the food supply and

weather conditions. There seems to be no reason to believe that any difference will be found in the number of weevils in infested fields in northern Texas as compared with southern Texas except as it may be controlled by these factors, for after the third brood becomes matured the number of weevils depends entirely upon these conditions.

DEVELOPMENT OF IMMATURE STAGES DURING NORMAL PERIOD OF HIBERNATION.

In southern Texas during an open dry winter larvæ, pupæ, and adult weevils may frequently be found in the injured bolls hanging upon the cotton stalks. In feeding upon the bolls the larvæ frequently eat a hole thru the septum between two locks and form a small cavity just under the inner surface of the lock. These feeding cavities become lined by the dried and hardened excrement, so that when a lock is broken to pieces the weevil cells may be separated out and have quite the appearance of seeds. It is within such cells that the immature stages pass the winter in the bolls. Occasionally, however, the larvæ eat into the seed, so that immature stages may be found actually within the seeds. This is undoubtedly not the usual habit and there seems to be practically no danger of disseminating weevils actually secreted inside of the seeds. We have been unable to make a personal examination of these conditions, but on February 20, 1903, Mr. W. P. Allgood, of Devine, Medina County, Tex., wrote us sending some cotton bolls and seed, in which we found 4 weevils alive, 1 dead, 1 newly transformed, 1 in a seed, and also 2 seeds which seemed to have been eaten out by weevil larvæ, but which contained only larvæ which may have been parasitic upon the weevil. The 4 live weevils were kept in a tube in our laboratory until about April 1, when they died, owing to the unsuitable conditions.

Several of the infested seeds were evidently entered before the shell was fully hardened and the normal development of the seed prevented, whereas in other cases the weevils were in seeds fully developed. It seems quite reasonable that the larvæ should bore into the seeds during the early winter, for as the cotton matures the seeds would be more succulent. However, it seems exceedingly improbable that weevils could be disseminated by being carried in the seed, for they occur within the seed only on unopened bolls which hang upon the plant, and very rarely would cotton in which weevils had entered the seed ever be ginned.

Early in March of the same year Mr. Allgood sent the writer quite a quantity of bolls, which were examined March 12 with the following results: Out of 200 bolls 165 contained no weevils in any stage, alive or dead, but of these, 20 per cent had been noticeably injured by weevils. Forty, or 20 per cent, contained weevils alive or dead in some stage. In these 40 bolls there were 40 live and 11 dead pupæ,

30 live and 40 dead adults, and 5 dead larvæ. Many of these weevils had just transformed from pupæ and were still soft and light brown. Some transformed after being received. But one live larva was found in all the material examined. Mr. Allgood wrote the writer that these bolls had been collected from stalks in a neighbor's field in which there were 7,000 plants to the acre, that each plant held from 12 to 15 bolls, and that the bolls sent in were picked at random from the field. Upon this basis, disregarding the live pupæ but counting the 30 weevils which were found alive as having survived the winter, there would have been 10,500 weevils per acre in the spring. If but one-third of these survived there would have been 3,500 per acre, or more than have ever been recorded in any field observations. If, as seems quite possible, but one-fifth survived, there would have been 2,100 per acre, which is approximately the number which survived in Lavaca County under the favorable weather conditions of the winter of 1903-4. Mr. Allgood wrote that cattle were then grazing in these fields, but it is doubtful if the cattle would have eaten many of the dry hardened bolls. In another lot of 48 bolls and forms sent by Mr. Allgood at the same time, we found 18 uninhabited large bolls, 15 forms, and 15 small bolls. These contained 17 live weevils, 4 live pupæ, 4 dead pupæ, and 2 dead larvæ, or one live weevil to every 3 bolls or forms. These weevils were confined in a wooden box in the laboratory and were still alive April 10, but later died, as no food could be supplied them at that time under temperature conditions such that they would normally have emerged. Doubtless they would all have emerged early in April at Devine. The temperature at Pearsall, the nearest weather station to Devine, during the winter was as follows: December, 1902, mean 54° , lowest 30° ; January, 1903, mean 51.8° , highest 80° , lowest 29° ; February, 1903, mean 52.8° , highest 77° , lowest 23° ; March, 1903, mean 60.6° , highest 82° , lowest 38° .

It will be seen that there were but few days during the winter in which the temperature was below freezing. The total mean temperature for these four months at Pearsall was but 63° less than the total normal mean for southwestern Texas during this time, and the rainfall at Pearsall was but 6.34 inches greater than the normal for southwestern Texas, no normal records for Pearsall being given. The total rainfall of these months is normally but 7.51 inches for southern Texas, so that the rainfall was nearly double the normal and the winter would appear to have been exceedingly unfavorable for the hibernation of weevils in their usual places of shelter. However, weevils which developed in the unopened bolls were almost entirely protected from the excessive rainfall, and the temperature being normal they would probably survive, while those weevils which went into hibernation in all usual places in the fall would doubtless have suffered an excessive mortality due to the unusual rainfall.

Immature stages and adult weevils are often found in early winter in the unopened bolls hanging on the stalks thruout the infested regions. We received live adult weevils in bolls from Hamilton, Hamilton County, in December, 1903, and they have been observed here and elsewhere, but we have no record of weevils having been found alive in these situations in early spring in central Texas, and it is exceedingly doubtful if many of them would survive the winter except in southern Texas.

TABLE II.—*Condition of immature stages of weevils after date of normal hibernation.*

Lot.	Date.	Number of squares or bolls examined.	Containing eggs.		Containing larvæ.					Containing pupæ, per cent of total.	Per cent of squares from which weevils emerged.	Per cent of squares showing weevil injury, but no stage present.	Remarks.
			Per cent of total.	Percent unhatched.	Per cent of total.	Per cent less than half grown.	Per cent over half grown.	Per cent alive.	Per cent dead.				
1903.													
1	Nov. 13	a 550	9.15	.....	25.5	.....	.....	.....	.....	0	.....	40.5	Collected Nov. 7. Squares frozen Nov. 18. Collected from plant Nov. 15.
2	Nov. 12	a 98	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	
3	Nov. 18	a 50	8	.....	24	10	14	.....	.....	0	.....	.....	
4	Nov. 20	a 200	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	
5	Nov. 22	a 100	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	Collected from ground Nov. 22.
6	Nov. 28	a 100	.....	.....	2	.....	.....	100	.....	.....	9	.....	Collected from ground Nov. 8.
7	Nov. 26	a 200	.....	.....	4	.....	100	100	.....	.....	4	.....	One-half collected from ground, one-half from plant, Nov. 1.
8	Nov. 30	a 200	.....	.....	2	.....	100	100	.....	.....	1	.....	One-half collected from ground, one-half from plant, Nov. 15.
9	Dec. 4	a 200	.....	.....	.....	.....	.....	.....	.....	.....	.....	b 100	One-half collected from ground, one-half from plant, Nov. 18.
10	do....	a 200	.....	.....	.....	.....	.....	.....	.....	.....	.....	b 100	One-half collected from ground, one-half from plant, Nov. 22.
11	do....	a 200	.....	.....	.....	.....	.....	.....	.....	.....	1	b 99	One-half collected from ground, one-half from plant, Nov. 24.
12	Dec. 12	{a 200 c 100	.....	.....	.....	.....	.....	.....	.....	.....	.....	b 100	One-half collected from ground, one-half from plant, Nov. 28.
13	Dec. 5	a 250	.....	.....	.....	.....	.....	.....	.....	.....	.....	b 100	b 87.2 b 95.8 b 96
14	do....	c 250	.....	.....	12.8	.....	.....	100	.....	.....	.....	.....	
15	Dec. 4	a 500	0	.....	42	57	43	100	.....	0	.....	.....	
16	do....	c 200	.....	.....	4	.....	100	.....	100	0	.....	.....	

a Squares.

b Squares with no stage of weevil in them. Percentage injured unknown, but probably 40 per cent as in lot 1.

c Bolls.

In November and December, 1903, Mr. Conradi made careful observations at College Station upon the condition of the immature stages after the freeze of November 18. The results of these observations are shown in Table II. It will be noticed that no pupæ or adults were found in over 3,600 squares and bolls examined, showing that egg laying had temporarily ceased during some period before November 1. The most probable explanation of this remarkable absence of

pupæ and adults in the presence of eggs and larvæ is that an outbreak of the cotton leaf-worm (*Alabama argillacea* Hbn.) had completely defoliated the plants during the latter part of September, preventing entirely the formation of squares, and thus stopping abruptly for a short time the multiplication of the weevils in squares. Subsequently squares were formed, and when these became large enough the reproduction of weevils was resumed after about November 1, so that most of the larvæ found were over half grown. In lots 4 and 5, when examined November 20 and 22, from 10 to 12 per cent of the eggs were still unhatched. It seems probable that at this time some of the eggs, but no large percentage, failed to hatch. Most of the larvæ died during the first stage and but few lived to be over half grown. On November 12, in lot 2, 25 eggs were found in 98 squares, which were collected November 7, showing that the egg period had been doubled. Mr. Conradi notes in this connection that the life-history period was first noticed to be decidedly lengthened after November 9, eggs laid November 10 requiring 5 days to hatch. From 24 eggs hatched between November 24 and 28, 15 larvæ died within a day after hatching, 7 by the time they were half grown, and but 2 developed into weevils, which emerged December 4.

On December 12 an occasional larva was found in the field and several were brought into the laboratory, where 3 transformed to pupæ January 7, but then died. They would undoubtedly have failed to pupate in the field.

MORTALITY OF HIBERNATING WEEVILS.

The mortality of weevils during hibernation is shown in Tables I and III. Table I gives the mortality of weevils confined in cages at different dates from October 7 to November 17, as previously described. In but two lots did weevils survive the winter. In these lots (5 and 7), of 500 weevils an average of 6.2 per cent survived the winter and were active between March 22 and March 24. On March 21, however, 10.5 per cent were alive, and it was noted that these weevils had been active since March 18, so that practically 7.5 per cent of the two lots survived the winter under the supposedly favorable conditions furnished them in the hibernation cages.

TABLE III.—*Percentage of weevils surviving hibernation in fields.*

Year.	Locality.	Number of weevils to a stalk in fall.	Weather: December- March.				Date first emerged.	Dates counted, inclusive.	Weevils counted.	Area counted.	Number of weevils to 100 stalks.	Percentage surviv- ing hibernation.
			Rainfall.		Tempera- ture.							
			Win- ter.	Nor- mal.	Win- ter.	Nor- mal.						
1900-1	Vienna <i>a</i>		<i>b</i> +5.54	8.32	+ 2.7	55.8	Mar. 10	.....	.....	10 acres		
1902-3	do.	1.5	+6.86	8.32	+ .5	55.8	.....	.....	.....	² / ₃ acre <i>c</i>		
1903-4	do.	(?)	-5.08	8.32	+14.1	55.8	Mar. 15	May 17 <i>d</i>	2,400	1 acre	31.0	<i>d</i> 30
1900	Booth	<i>e</i> +5.71	14.47	- 5.0	55.5	.....	May 22-31.	2,000	2 acres	13.0	13	
1903	Hunter	<i>f</i> -9.60	7.02	- .8	54.7	.....	May 30	6	140 stalks	4.0		
1902	Wellborn	<i>g</i> -8.84	13.40	- 9.1	55.7	.....	May 22-29.	397	2 acres	2.5	2.5	
1903	do.	<i>h</i> 2.00	<i>g</i> -2.91	13.40	-11.6	55.7	May 8	June 26- July 17.	1	2,125 stalks	.04	.08
1903-4	do.	1.00	<i>g</i> -2.45	13.40	+ 2.1	55.7	Apr. 17	May 20- June 17.	26	1,600 stalks	1.6	1.6
1903	College Sta- tion. <i>i</i> . . . . .	.....	-1.38	12.72	- 3.5	53.6	May 15	June 18	5	940 stalks	.5	.....
1903	do. <i>k</i> . . . . .	.....	-1.38	12.72	- 3.5	53.6	.....	do	2	40 stalks	5.0	5.0
1904	do. <i>l</i>	.75	-6.12	12.72	+14.1	53.6	Mar. 29	May 19- June 14.	49	2,930 stalks	1.66	1.66
1904	do. <i>m</i>	1.00	- 6.12	12.72	+14.1	53.6	Apr. 1	May 22- June 9.	20	1,840 stalks	1.0	1.0
1904	Rosprim. <i>n</i>	(?)	-6.12	12.72	+14.1	53.6	Apr. 8	June 7	10	1,000 stalks	1.0	.....

a Observations by Louis Teltschick.*b* Record for Hallettsville.*c* Three-fourths-acre trap rows.*d* Estimate of several fields, May 17.*e* Records of Houston, as far as given.*f* Record for New Braunfels.*g* Records for Brenham.*h* August 17, 2 weevils per 100 stalks.*i* In sorghum in 1902.*k* Cotton, 1902, a crossroad by barn.*l* Cotton not destroyed in fall of 1903.*m* Cotton destroyed in fall of 1903.*n* In corn in 1903.

In the field we have never found the percentage surviving at the college to approach this number, except in one instance. As shown in Table III, in the spring of 1903 cotton was planted near the college barn, where it had been grown the previous year and left standing. The weevils had the most favorable conditions possible for hibernating around the barn. They appeared so numerous on the cotton in the following spring that on June 18 there were 5 hibernated weevils to every 100 stalks. More weevils were found in this cotton thruout the year than in any other locality. If it be fair to assume that about one weevil to a stalk occurred in this field at the time of hibernation in the fall of 1902, then about 5 per cent survived. It is quite possible that there were more than this number in the fall, and the percentage surviving would therefore be somewhat less. Elsewhere, in the neighborhood of the college, not over 2 per cent have ever been found to survive the winter in the field, tho several fields within a distance of 4 miles have been carefully observed.

In the Brazos bottom, on Smith & Carson's plantation, Professor Mally (report,^a p. 16) records picking 397 weevils from 2 acres May 22-29, 1902, or 2.5 weevils to 100 stalks, which would give not over 2.5 per cent surviving hibernation. In 1903 but 1 weevil was found to 2,125 stalks, or 0.04 to 100 stalks, which would give a percentage of hibernation of not over 0.04 and probably 0.08, as there were 2 weevils

^a Report on the Boll Weevil, Austin, Tex., August, 1902.

to a stalk the previous fall. During the present year (1904) but 1.6 per cent survived hibernation on the plots counted. This figure is open to slight error, as upon this plantation there were possibly 20 acres of cotton about a mile away, which were planted much earlier than was most of the plantation. This early cotton was infested at the rate of 20 weevils to 100 stalks on May 31. It is evident that the weevils which hibernated on the plantation as a whole had concentrated on this early planting, but if the total number of weevils upon this early cotton had been distributed over the whole acreage there would have been not over $2\frac{1}{2}$ weevils per 100 stalks or 2.5 per cent surviving hibernation at the most. Two per cent would probably be very nearly correct. At Victoria, Hunter and Hinds have shown that approximately 15 per

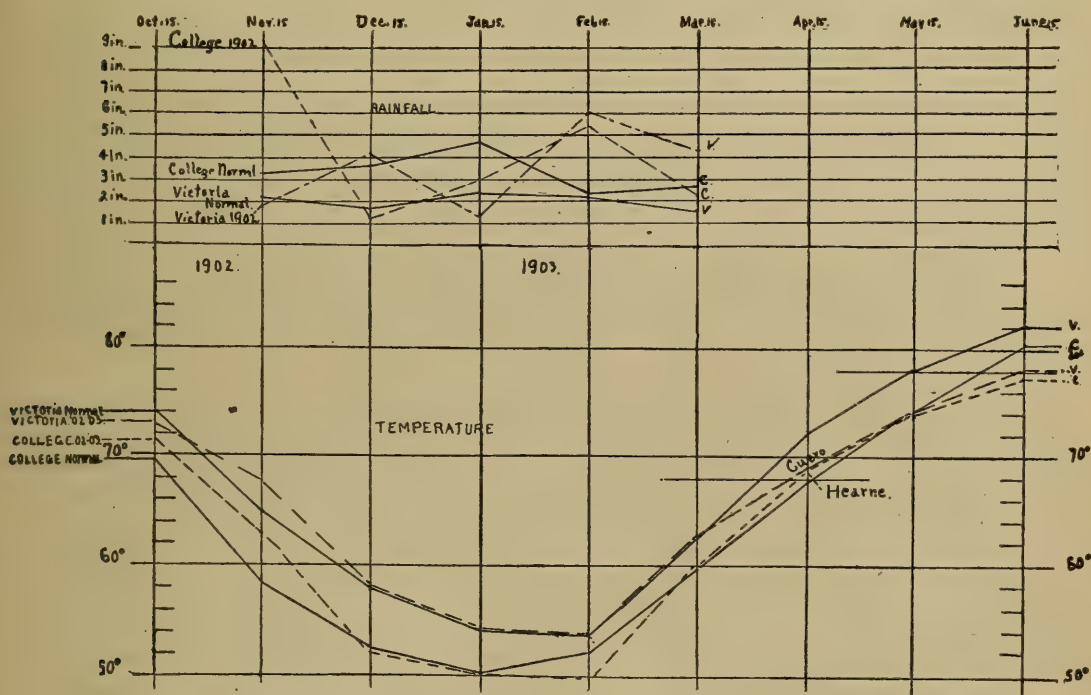


FIG. 3.—Rainfall and temperature records of College Station and Victoria, Tex., for 1902-3, compared with normals.

cent of late-developed weevils survived the winter of 1902-3 in hibernation cages. The very careful records made by Mr. Teltschick by hand-picking the weevils during the spring (see p. 59 of that report) shows that this very closely approximates the number of weevils normally surviving under field conditions in Lavaca County, but that during the last winter (1903-4) fully 30 per cent of the weevils, or twice as many as usual, hibernated successfully. In 1900 Professor Mally's records (l. c., p. 32) show that Mr. Kramer picked 2,000 weevils at Booth, Fort Bend County, or 13 to 100 stalks, which would give at least 13 per cent surviving the winter, in a latitude practically the same as that of Vienna. It will be seen, therefore, that whereas 15 per cent may be considered an average of the number surviving

hibernation in southern Texas, normally only about 2 per cent, and never over 5 per cent, survive under field conditions at College Station, and about $2\frac{1}{2}$ per cent in the Brazos bottom at Wellborn. In other words, only about one-fifth as many weevils survive the winter here as do in southern Texas. Whether a corresponding difference will be found in the mortality between central Texas and northern Texas remains to be determined. This will depend on the weather conditions discust below, but it seems doubtful that there will be so great a difference.

TIME OF GREATEST MORTALITY DURING HIBERNATION.

In Table I it may be seen that in lots 4, 5, and 6, including 600 weevils, there was a mortality of at least 51 per cent during the month of December, and that in lot 5 there was a mortality of 9.6 per cent during January and but 2.8 per cent during the remainder of the year. Referring to figure 2 it may be seen that at College Station in the winter of 1903-4 the rainfall was greatest in December, while during the balance of the winter it was below normal. The maximum in December approached the normal, whereas usually the maximum for winter occurs in January. The temperature was very close to normal thru January, but considerably above normal during the remainder of the winter.

In general, an excessive rainfall seems to be a most important factor in increasing the mortality of the weevil. The temperature does not usually depart sufficiently from the normal to be an important factor, except that when occurring with a deficient rainfall an excess of temperature appears to be decidedly beneficial to hibernation. By referring to figures 4 and 5, showing the normal rainfall and temperature for Hallettsville, Tex., and the monthly mean temperature and rainfall during the winters of 1899-1900, 1900-1901, 1902-3, and 1903-4, it may be seen that in 1900-1901 there was a decided deficiency in rainfall and a slight excess in temperature, whereas in 1902-3 there was an abnormally large rainfall and a nearly normal temperature. In 1901 and 1904 the weevils survived in unusually large numbers, while in 1903 the number hibernating successfully was considerably less than normal. The same general conclusions are shown when the rainfall and temperature records as given for College and Brenham in Table III are compared with the percentage of weevils surviving at College and in the Brazos bottom below Wellborn. The rainfall and temperature records are shown diagrammatically in figures 2 and 3, giving also the normal rainfall and departure from normal for College Station and Victoria in 1902-3 and 1903-4.

If it be true that the rainfall is the most important climatic factor in the mortality of the hibernating weevils, it is interesting to compare the rainfall of different sections of the State as given by the

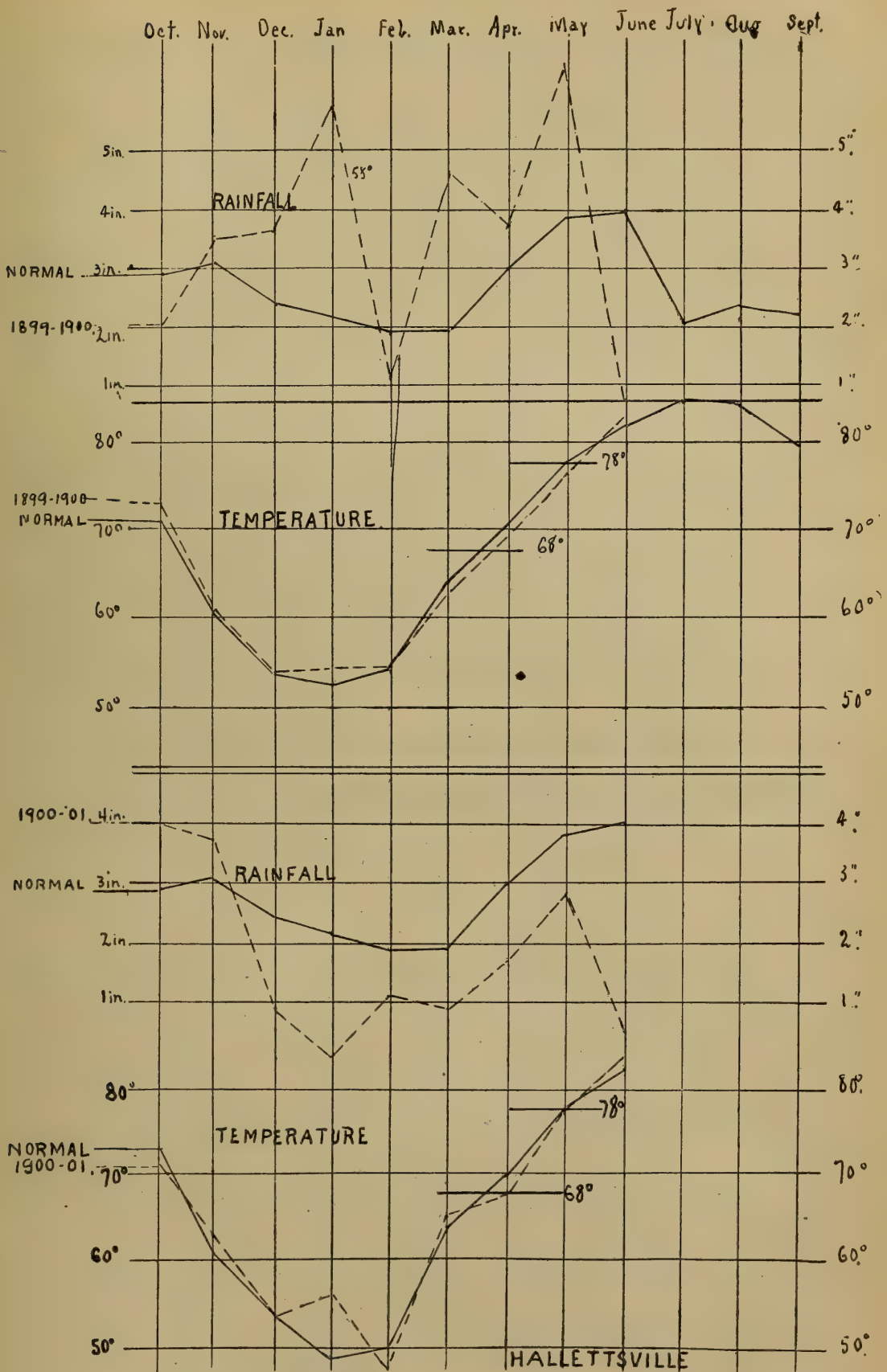


FIG. 4.—Rainfall and temperature records, Hallettsville, Tex., 1899-1901, compared with normals for each year.

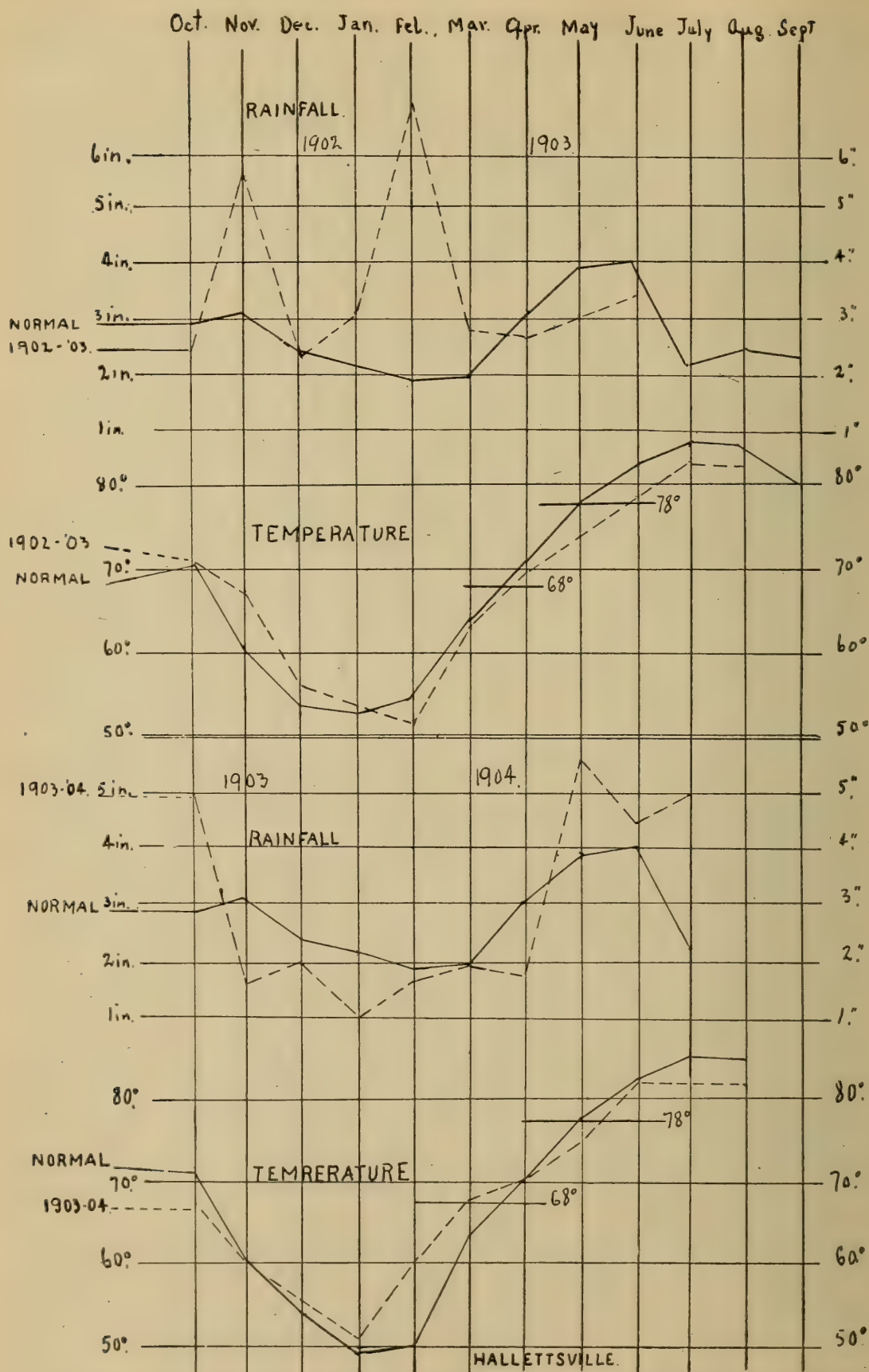


FIG. 5.—Rainfall and temperature records, Hallettsville, Tex., 1902-1904, compared with normals for each year.

Texas section of the U. S. Weather Bureau. The normal total rainfall during the winter months of December to March for southwestern Texas is 6.46 inches, for the coast country 8.26 inches, and for central Texas 9.83 inches, while the total normal effective winter temperature^a during December to March, inclusive, is, for southwestern Texas 1,631.4° F., for the coast country 1,190.6° F., for eastern Texas 1,483.1° F., for northeastern Texas 934.9° F., and for central Texas 1,294.3° F. The average effective temperature for the eastern and southwestern countries is therefore from 200° to 300° higher than that of central Texas for this period and from 450° to 700° F. higher than that of the coast and northeastern Texas. If we consider the more critical period of December to February, inclusive, the southwestern and eastern countries have 300° to 200° F. more effective temperature than central Texas and from 600° to 500° F. more than northeastern Texas. It would therefore seem that both the temperature and rainfall are far more favorable to the successful hibernation of the weevil in southwestern Texas than in central, coast, or northeastern Texas, and that the conditions as to temperature and rainfall in the coast country during the critical period are very similar. In northeastern Texas, however, as the weevils do not emerge from hibernation until considerably later in the spring, the larger rainfall occurring during April may have some effect on them.

As before mentioned, floods during the period of hibernation seem to have a marked effect upon the mortality of the weevil, as there were notably fewer weevils thruout the Brazos bottom in this section in the spring following the flood of February, 1903.

PLACES OF HIBERNATION.

Considerable time has been spent in attempting to find the places in which the weevils spend the winter, but the results have been rather unsatisfactory. This has also been the experience of many observing practical farmers. Numerous cotton fields were examined in the neighborhood of the college during January and February, 1903, and tho Mr. Newell and the writer made diligent search in all conceivable places over a considerable acreage, embracing an area of 2 miles, examining cornstalks, grass, bark, fence posts, gins, etc., we found but 1 live boll weevil during the winter and this one was under a small pile of dried manure. On November 29, 1903, Mr. A. F. Conradi found 2 weevils in a pile of old cotton brush in our experimental field, 3 under the bark of a log near the field, and 2 in the cotton field under a bunch of dead cotton leaves. On December 15 a thoro examination

^aTotal normal effective temperature is reckoned for each month by subtracting 43° F. (the point at which animal activity is supposed to begin) from the normal mean temperature for that month, multiplying the difference by the number of days in that month, and adding together the four products thus obtained.

was made of logs, leaf rubbish, etc., in a ravine adjoining our cotton field, but no weevils were found. On December 28 a similarly futile search was made along Carters Creek, in which neighborhood a good deal of cotton had been grown. On January 5, 1904, a 30-acre cotton field was thoroly examined, but no weevils were found. Corn stubble standing near a very badly infested field was also examined without finding any weevils. Our information regarding the hibernating places of the weevil is therefore more of a deduction based upon observations of the places in which they appear first in the spring than a conclusion from actual observations. The observations by Mr. Conradi in the early winter probably indicate the normal places for hibernation—that is, under dead leaves, in old cotton brush, and under loose bark. In the hibernation cages, where the weevils were furnished an abundance of rubbish, it was found that many of them which were hibernating successfully had crawled into the cavities made by borers in dead wood and in similar positions where they were well protected. It has been often noticed that in a wooded country the weevils appear first in spring along the borders of fields next to the woods and gradually work inward from the edges, so that it seems probable that in a wooded country most of them hibernate in woodland. Around outbuildings and barns also are found favorable places, as there is always more or less rubbish and protection in such situations. In 1903 more than five times as many weevils were found in a piece of cotton near the college barn, where cotton had been grown the previous year, than were found in any other locality in that neighborhood. It is also noticeable that weevils are always more numerous near gins than at a distance from them. Undoubtedly, where much rubbish and grass are present and where the soil remains loose and is not packed by rains, large numbers of the weevils winter in the cotton fields. The fact that in 1903 an exceedingly small number of weevils survived on Smith & Carson's plantation on the Brazos River must have been due to their having hibernated in the field, large numbers having been killed off by the excessive rains and doubtless more by the flood of February, 1903, which covered the fields to a depth of several inches over a large part of the plantation. It was quite noticeable that few weevils were found on Brazos bottom plantations in this section in 1903. In all probability the flood would have had but little effect later in the season after the weevils had emerged.

It is noticeable that weevils are much more abundant where cotton is planted in fields where sorghum stubble has been allowed to remain all winter adjoining a last year's cotton field. Thus, in the spring of 1904, the first weevils found on Smith & Carson's plantation were on a cut of cotton along the Brazos River which had been in sorghum and surrounded by cotton in 1902 and where several large sorghum stacks stood thru the winter. Tho planted early and kept well cultivated,

so little cotton was made on this piece that it was not worth picking, while cotton planted at the same time and cultivated in the same manner on other parts of the plantation made a good yield.

Professor Mally (l. c., p. 57) has given the observations of Mr. Teltschick upon finding weevils hibernating in the crevices of the soil around the cotton stalks and roots, at a depth of 3 inches. On March 7, 1901, a raw, windy day, upon 35 stalks, he found 7 live and 2 dead weevils from 1 to 3 inches below the surface. In September, 1902, he stated that he had again found weevils in a similar situation during the previous spring, but not as many of them as in 1901. Mr. Teltschick recently writes as follows:

I found but few weevils in crevices around stalks during the last two winters, partly because there were no crevices (frequent rains filling them up as soon as formed) and partly because freezes were severe enough to keep cotton from coming out during any part of the last two winters; whereas in 1900 we had neither rain enough to fill up crevices nor frost enough to keep cotton from budding out at intervals at the base of the stalk, which latter fact accounts, no doubt, for the relatively large number of weevils found within the crevices.

TIME OF EMERGENCE FROM HIBERNATION.

Hunter and Hinds^a state that the first weevils emerge when the mean average temperature has been for some time above 60°. Our observations at the college upon the earliest emergence from hibernation are as follows: In 1903 the first weevil was found on May 15 at the college after carefully searching about 100 feet of unchopped row. Repeated examinations during the next two weeks showed but a very small number of weevils. On May 8 a weevil was found in the Brazos bottom after hunting about 20 minutes, and after May 5 planters in the bottom occasionally reported finding weevils. In 1904, on cotton planted March 17, the first weevils were found on March 29. On April 17 and 18 only an occasional weevil could be found at College Station or in the Brazos bottom after a considerable search. In 1903 Mr. Teltschick wrote me on March 1 from Lavaca County as follows:

Up to a severe freeze of two weeks ago (February 16-17) I could at any time find some—not many—in my neighbors' fields apparently feeding on buds or small leaves at the base of the stalk, which had never been entirely frozen.

However, he did not find many on his own cotton until April, when he picked some from trap rows which were planted on March 13. In 1904 he noticed the first weevils about the middle of March, but, as in previous years in other localities in southern Texas, we have records of their feeding on shoots from stumpage cotton much earlier than this. In general, it seems that when the normal mean temperature

^a Bul. 45, Div. Ent., U. S. Dept. Agric., p. 82.

passes 68° F. the first weevils commence to emerge from hibernation, and this conclusion is confirmed by all of our observations.

It will be seen from the temperature curves in figure 2 that at Victoria the normal mean temperature usually reaches 68° about April 1 and at College about April 15. Figure 2 shows that in 1903 the mean average temperature reached 68° about one week later at Victoria. In 1904 (fig. 2) the mean temperature reached 68° about March 10 at Victoria and the first weevils were found about the middle of March, which is also true of Lavaca County. while at College Station 68° was reached a week later than usual, but the temperature was above 66° for the month preceding April 15. If the mean rise in temperature from February 15 to May 15 be plotted, the line would reach 68° about April 5, which very closely approximates the date of the first

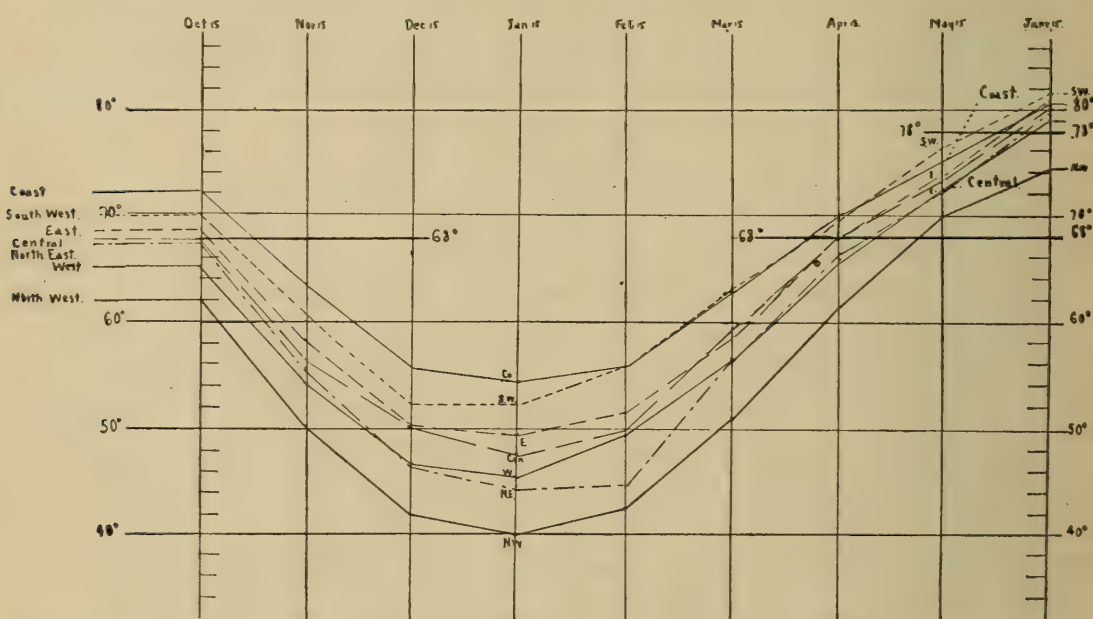


FIG. 6.—Comparison of normal temperatures, October 15 to June 15, for various districts in Texas:

appearance of the weevils at College Station for that year. From all the data available, therefore, it seems very safe to assert that when the temperature reaches 68° or has been above 65° for several weeks the first weevils will emerge. By consulting figure 6 this time may be seen for any section of the State. The curve shows that weevils would normally emerge from hibernation about 10 days earlier in the southwestern and coast countries than in central and northeastern Texas, and about 20 days earlier than in northwestern or western Texas.

The greatest number of weevils emerge considerably later and usually about the time cotton commences to square. The time of the principal emergence and the beginning of general oviposition by the hibernating brood is practically the same. A few belated weevils appear after this time, as is shown by the field records of Mr. Telt-schick for 1903 and 1904. For if the bulk of the weevils emerges at the

time the cotton commences to square freely and frequent counts be made, the number will be found to decrease for a few days, and there is then a sudden rise due to the maturing of the first brood early in June, and it is practically impossible to determine in the field whether any hibernated weevils subsequently emerge. However, in 1904, it is certain that no weevils emerged later than June 29, for at that date practically no weevils could be found in the field, tho the bulk of the hibernating weevils appeared from June 5 to June 10. Consequently this year (1904) certainly no weevils emerged later than 22 days after the maximum number.

It has previously been shown by Professor Mally (l. c., p. 16) and by Hunter and Hinds, and noted above, that the weevils emerge gradually over a period of from 4 to 6 weeks, normally more nearly the latter time. This range covers practically the same length of time as from planting to the formation of the first squares on the bulk of the cotton in any given community. The gradual emergence from hibernation is shown by the number of weevils to 100 stalks in Table III for 1904 at College Station. In 1903 Mr. Teltschick picked the weevils from three-fourths of an acre of trap rows, planted March 13, on which the first bloom appeared May 28, and secured weevils as follows:

April, about 40 weevils.

May 4, 36 weevils picked in 1 hour's time.

May 11, 43 weevils picked in 1 hour's time.

May 18, 68 weevils picked in 2 hours' time.

May 25, 54 weevils picked in 4 hours' time.

In 1904 Mr. Teltschick made observations especially to determine this point. His notes are as follows:

Two plats of one-fourth of an acre each were selected in that part of the field which was farthest away from my own as also from any other cotton patch. The two plats themselves were separated by 25 rows of corn and surrounded by sugar cane on two sides and by timbered land on the other two. No cotton had been grown on or near these plats in 3 years. Plat 1 was planted in King cotton March 4, was up to a good stand March 14, and chopped to a stand April 11. From plat 1 the weevils were picked as follows:

April 1, 14 weevils.

April 11, 27 weevils.

April 21, 26 weevils.

May 2, 96 weevils.

May 12, 140 weevils.

May 23, 150 weevils.^a

Plat 2 was planted in Shine cotton April 25 (7 weeks later than plat 1), was up to a good stand April 30, and was chopped to a stand May 12 (one month later than plat 1). On plat 1 the first squares appeared May 2 and on plat 2 May 28. All fallen and flared squares were picked up on both plats at intervals of 8 days up to July 1. From plat 2 there were picked, on May 12, 3 weevils; May 23, 35 weevils.

These records show very clearly the gradual emergence of the weevils from winter quarters. In 1903 the maximum number of weevils

^aWeevils were picked also during June, but these doubtless belonged to the first summer brood.

appeared on May 18, in 1904 on May 23, and in 1901 on May 10-15; but as the intervals between pickings were a week or 10 days it would seem safe to judge that the normal time for the maximum number to emerge at Vienna is about May 15 to 20. It will also be noticed that the weevils appear much more rapidly and early on early planted cotton, but the maximum number does not appear at the time of squaring of the earliest planted cotton, but at about the time of squaring of the main crop, thus giving a decided advantage to the early planted cotton. The determination of the exact time of the emergence of the maximum number of weevils will be practically the same as that for the time of maximum oviposition for the hibernating brood, concerning which see page 25, and which in Lavaca County will normally occur about May 20, at College Station about June 1, and in northern Texas probably about June 10.

PREVENTION OF HIBERNATION.

It may be readily seen from the foregoing discussion that any methods which will reduce the number of weevils going into hibernation in the fall are of the utmost importance in the control of the pest, inasmuch as nature aids in further reducing their numbers during the winter. All students of the problem of boll-weevil control have agreed that in this prevention of successful hibernation lies the most effectual means of reducing the numbers of the weevil and preventing injury the next season. Two methods are advocated: (1) The destruction of the stalks in the fall as long before frost as possible, and (2) rotation of the cotton crop, planting on land not in cotton the previous year and as far from such land as is possible.

FALL DESTRUCTION OF STALKS.

By the destruction of the stalks as early as possible in the fall the number of weevils entering hibernation is reduced in several ways: (1) All immature stages in the squares and bolls, which might develop into weevils if the stalks remained standing, will be destroyed. (2) Probably three-fourths of the adult weevils in the field at the time of burning may be destroyed if the work be properly managed. (3) By clearing the field of cotton some time before the normal time when weevils will enter hibernation their food is destroyed and the adults either starve or migrate to other fields. Were this work done uniformly over a considerable area, the weevils would surely starve, as they can not be forced into hibernation before the normal time. That a large mortality follows if this is attempted is shown in our records (see pages 2-3). These advantages are apparent, tho but few actual records of the benefit of such fall destruction of stalks have been published. From the conditions under which experiments must be made it is difficult to demonstrate in a tangible way the actual

benefit to be thus derived, but in the case of plats burned over in the fall of 1903 we found there were far fewer weevils in 1904 than in fields where the stalks had been left.

On October 23 and 25 the stalks on our experimental plats, covering about 30 acres, were cut with a single cutter made of a V-shaped sled, with knives projecting out and backward on either side about a foot beyond the rows. A team draws the cutter with a man on it, cutting 2 rows at once and about 15 acres per day. The stalks were then raked and piled, and were dry enough to burn in a week. On one-half the field 2 rows in every 20 were left standing as trap rows. No weevils were found later on the dried piles, but they had assembled in large numbers on the standing trap rows. Thirty-six were found on four plants. These trap rows were then cut, left over night on the ground, raked the next morning, and placed on the dried piles. That afternoon examination by the writer showed that on the green stalks on the dried piles there was an average of 1 weevil to every square and boll, often 5 or 6 being found on a square. The torch was then applied and the piles quickly burned. After this many weevils were found on the shoots growing out from the stumpage and an occasional stalk that was left. (This might be obviated more completely by plowing out the stalks.) A herd of cattle was therefore turned into the field and all herbage was devoured in a very few days. A better destruction could hardly be desired, and but little extra labor and expense was involved.

At the apiary a small plat containing two-thirds of an acre was left with the stalks standing all winter. This plat was surrounded by a grove and was half a mile from other cotton.

Observations by the writer show that in 1904 upon the 30 acres upon which the stalks were burned there appeared of the hibernated brood during the spring but 1.2 weevils to 100 stalks, while on the apiary plat where the stalks had been left there were about 4 weevils to 100 stalks, or over three times as many hibernated successfully where stalks remained standing as where they were destroyed.

Again, on July 13 the field where stalks were burned averaged 3.3 weevils to 100 stalks, while fields of Messrs. Boyett and Gray, just over the railroad, not 100 yards distant, where the stalks had not been burned, tho other conditions were practically similar, had 6 and 12 weevils to 100 stalks, respectively, or an average of three times as many weevils as on the field where stalks were burned.

Were all conditions exactly the same, as regards culture, land, etc., and were it possible to prevent the migration of the weevils from neighboring fields to those where the stalks had been burned, the latter would undoubtedly show a much greater yield at the end of the season, but as it is very rarely possible to eliminate these factors the

above records show in a striking way, based upon extensive counts, the difference in amount of infestation during early summer where stalks have been destroyed the previous fall.

CROP ROTATION.

The value of the rotation of crops was strikingly shown by the difference between the number of weevils occurring on the experiment station variety plats at the college barn, where cotton had been planted the previous year (1902), with corn adjoining, and our plats, situated a mile distant on land which had never been in cotton, having grown sorghum in 1902, tho cotton was grown not 100 yards distant. The cotton was planted April 5 at the college barn, and on June 17 there were 5 weevils to 100 stalks, 2 being found on the 40 stalks examined, whereas on the other field there were but 0.5 to 100 stalks, only 5 being found on 940 stalks examined. Again, on August 13 the varieties at the barn, planted May 3, had 233 weevils to 100 stalks, 163 being found on 70 stalks, while only 5.5 to 100 stalks occurred in the field where there had been no cotton the previous year, only 10 being found on 180 stalks from all parts of the field. On the same day 48 weevils to 100 stalks were found on Mr. James Boyett's cotton, just across the railroad from our field, his land having been in cotton the previous year, while on Mr. Suber's cotton, a mile distant, 53 to 60 per 100 stalks were found, this crop also following cotton.^a

WHERE THE WEEVILS FIRST APPEAR.

It has been frequently observed in all parts of the State that the weevils first appear on the cotton field along the side adjoining woodland, if there be any timber adjoining. From the extensive reports of observers thruout the State there seems to be no doubt that cotton in timbered sections is much more seriously injured by the weevil than that on prairie land, owing to the more successful hibernation in the timber. It has also been observed by many that the weevils first appear and commence to be injurious in that part of the field where they were most abundant during the previous year. In southern Texas the weevils may be found on stubble cotton very early in the season; in fact practically all winter. They hardly seem to hibernate in the strict sense of the word, as under such conditions they are found feeding on warm days practically thruout the winter.

Upon emerging from hibernation the majority of the early weevils seek the earliest cotton, which may be either stubble cotton or planted, and they will be found more abundantly upon it than elsewhere, even tho the early cotton forms but a very small part of the acreage on a

^aThe same value of rotation has been noted by Mr. Louis Teltschick at Vienna. (See Mally, Report on Boll Weevil, 1902, p. 66, paragraph 4.)

large plantation, and altho later cotton may be up, but still small. Having assembled upon the early cotton, most of these weevils seem to stay upon it until it squares, and they do not spread generally to the later cotton until it also commences to square. This habit must be taken into consideration in estimating the number of weevils upon a given area in the spring, for if the cotton be not planted at the same time over the entire place, neither the earliest cotton nor that planted later will give a fair idea of the number of weevils which have hibernated successfully. The total area must be taken into consideration and the average for the whole place estimated by duly weighting the number found upon the acreage of both early and late planting. By the time the majority of hibernated weevils emerge, however, the medium and late-planted cotton will be so far advanced as to hold the weevils near where they emerge, and no further concentration may be expected.

SUMMER BROODS OF THE WEEVIL.

The first summer brood of weevils from eggs deposited by the hibernated adults begins to emerge from squares during the last ten days in May in southern Texas, and farther north, in central and northern Texas, continues emerging during June and the first ten days in July. Thus in Lavaca County there is a marked increase in the number of weevils found in the field after June 1 or sometimes during the last week of May. In 1901 Mr. Teltschick secured 2,136 weevils up to the third week of May on 10 acres, the maximum appearing during the second week of May; but during the last week of May he secured on the same area 2,114 weevils, or very nearly as many as during the whole spring, showing that the first new brood was then emerging. In 1903, up to June 1, on three-fourths of an acre of trap rows he had picked 241, with a maximum on May 18; but on June 1 he secured 368, and during the month of June 1,759, with the maximum number on the 15th. In 1904, on the one-fourth-acre plot previously mentioned he secured 453 up to June 1, the maximum number of 150 on May 23; but on June 4 250 were secured and 146 on June 18. Mr. Teltschick writes as follows:

In my opinion very few weevils, if any, matured from punctured squares before June either in this or previous years in this section. Cotton planted here March 1 (this is as early as any is planted, the greater bulk never being planted before April 1) as a rule begins to form squares on April 25. It requires the squares at that time from two to three weeks to grow large enough to provide the food necessary for the development of the weevil. The squares are, of course, being punctured as soon as they form, and I doubt whether any eggs are deposited in them so long as they are too small to permit the weevil secreting itself within the involucre.

At College Station the first fallen squares were found on June 17, 1904. The first weevils from these squares emerged June 23 and the

last on June 29. At Terrell, Tex., the first brood commenced to emerge on June 30 and the last of these was secured on July 12.

Altho the hibernating weevils may continue to oviposit for some time there seems to be but little overlapping in the appearance of the first and second generations of weevils. There is a period from the first to the middle of July thruout the greater part of the infested area when but little damage is reported from the weevil and when but few weevils are found. This is the period during which the second brood is developing within the squares. About the middle of July and during the next ten days the second brood of weevils appears and is generally reported. In some instances the injury by the second brood is serious, especially where large numbers have hibernated successfully, and after the second brood appears practically all the squares become punctured and no more cotton is made. This condition is more common in southern Texas, but usually the injury by the second brood is no more serious than that due to the first in late June, and in a great many cases it is reported as being decidedly less. In general, unless there be exceptional rains, the hot suns of July seem to check the development and injury of the weevil.

The distinction between the second and third broods is not so marked. The period of oviposition of the second brood doubtless being longer than that of the first, the third brood commences to appear before the last of the second brood has emerged. However, there is still a very decided and notable increase in the number of weevils from the first to the middle of August, depending upon the latitude and season. This is generally noticed, and commonly reported as the third brood. Usually with the emergence of this brood the weevils have become sufficiently numerous to destroy all the squares as they form so that no more blooms are seen. From this time the weevils attack the maturing bolls much more frequently. After the appearance of the third brood the different generations become so involved that it is impossible to distinguish between them.

At Terrell, Tex., five distinct broods were reared in 1904 up to October 3, and these weevils then commenced to oviposit, so that there would doubtless have been a maximum of six complete broods in that locality. The records at Terrell are as follows: From the first fallen squares injured by the hibernated brood, weevils emerged on June 30, July 5, and July 12. On July 5 these weevils were placed in a cage upon fresh squares, and the weevils developing from these squares emerged on July 22, or in from 17 to 22 days. These were placed on squares on July 23, and the weevils from them, or the third brood, emerged August 17 to 20, or in 25 to 28 days. These weevils were placed on squares August 20, and the weevils developing from them, or the fourth brood, emerged September 8 and 9, or in 19 to 20 days. These were placed on squares September 10, and the weevils

developing from them, or the fifth brood, emerged October 3, or in 23 days. In all cases this period of development includes to a greater or less extent the feeding period, which must precede oviposition.

Practically the same number of generations seems to occur at College Station. Altho we have not determined this by rearing weevils as rapidly as possible thruout the season, the field records show the first three broods very distinctly, and during the fall there seem to be three more broods between September 1 and the time of hibernation. The number of broods after September 1 is very largely controlled by the temperature and rainfall, which combine to affect the food supply and the mortality of the developing weevils. It is probable, however, that in a late season seven broods might develop at College Station, as the field records (see page 10, Table II, for 1903) show the weevils (probably of the sixth maximum brood) to have been freely ovipositing early in November, and if frosts did not occur until late in that month a large number of these would probably emerge.

In southern Texas, Hunter and Hinds have shown that with the average season of reproductive activity, extending from May 1 to November 15, eight generations may be produced during the year. Thus there is probably a difference of two broods in the maximum number of generations between southern Texas and northern Texas, but this difference will not materially affect either the injury by the weevil or the number of weevils going into hibernation, as the weevils seem to reproduce in practically the same length of time in northern Texas as in southern Texas, the summer temperature being nearly the same, and after the third brood they are sufficiently numerous in either section to prevent the further fruiting of the crop. Nevertheless, factors aside from a difference in the number of generations will probably cause less damage in northern Texas.

By September 1 to 15 the weevils usually reach the maximum number and during the fall, as before observed, their number depends primarily on the food supply and weather conditions, so that the number going into hibernation depends on local conditions. The difference in the amount of injury which the weevil may do in central or northern and in southern Texas will depend therefore, first, upon the smaller number of weevils hibernating successfully and, second, upon their appearing later in the spring so that the cotton may be able to make a more rapid growth in comparison with the development of the early broods of the weevil under the high temperatures prevailing during early summer in northern Texas than will be the case farther south in late May. But it is not probable that the mere number of broods will make any material difference in the amount of injury. The first three broods seem to be well defined, as is clearly shown by the numerous reports of our voluntary observers and by the reports of the observers of the crop service of the U. S. Weather Bureau. The amount of

injury done depends upon the abundance of these broods, which depends largely upon the time of appearance and also upon the relative abundance of the hibernating brood.

MORTALITY OF SUMMER BROODS.

The mortality occurring in summer and fall broods may properly be distinguished from that among weevils which hibernate, for in the summer the greatest mortality occurs in the immature stages. The number of weevils developing from squares in which eggs have been laid is shown in Table IV.

TABLE IV.—*Percentage of weevils from infested squares.*

Lot.	Date.	Where picked and how kept.	Number of squares.	Per cent emerged.	Weighted per cent emerged.
1	May —, 1902	Picked from ground; placed in cloth bags and kept in laboratory under dry conditions	11,250	23.5	23.5
2	July 8, 1904	Picked from ground; kept under fairly normal conditions	1,522	39	.....
3	Sept. 10, 1903	do	675	30	.....
4	Sept. —, 1903	do	350	34	.....
5	Sept. 21, 1903	do	377	23	.....
Total of lots 2, 3, 4, and 5			2,924	.....	34.3
Total of lots 1, 2, 3, 4, and 5			14,174	.....	25.7
6	Sept. —, 1903	Picked from plants; ^a kept on moist soil	162	40	40
7	Sept. 21, 1903	Picked from ground; kept between shaded rows	200	39.5	.....
8	do	do	43	30	.....
Total of lots 7 and 8			243	.....	37.8
Total of lots 6, 7, and 8			405	.....	38.7
9	July 15, 1904	Picked from ground, under screen; placed in part sun	400	9.0	9.0
10	Sept. 11, 1903	Picked from ground; placed in sun	210	2.3	.....
11	Sept. 22, 1903	Picked from plants; ^a placed in sun	68	2.9	.....
12	Sept. 11, 1903	Picked from ground; placed in sun	354	0	.....
13	Sept. 21, 1903	Picked from plants; ^a placed in sun	91	1.1	1.1
Total of lots 9, 10, 11, 12, 13			1,123	.....	3.9

^a Picked from plants when squares would drop off by touching them.

Lot 1 is based upon the following note made by Mr. Wilmon Newell. During May, 1902, Professor Mally gathered infested squares in fields along the Brazos River below Wellborn. About 1½ bushels of these squares were brought to College Station, sewn up in cheese-cloth sacks, and weevils allowed to hatch. June 15 the weevils were picked out and by careful measurement there were 115 c. c. of them, and 15 c. c. contained 345 weevils, or 1,763 weevils to a bushel. Subsequently we have found about 7,500 squares in a bushel, thus indicating that only about 23.5 per cent produced weevils. The squares were kept in the laboratory in a dry place, and the lack of moisture may probably account for the low percentage producing adults. In another test 2,924 squares gave a weighted average of 34 per cent producing weevils. These were picked up and kept under fairly normal condi-

tions. From 405 squares which were kept on moist soil or between shaded rows weevils were developed from 38.6 per cent, but where the squares were left in the hot sun, among 1,123 squares but 1 per cent produced weevils. This shows strikingly the value of having rows wide apart so that the sun may strike the fallen squares.

TABLE V.—*Percentage of mortality of weevils at different stages of development.*

Lot.	Date.	Picked from—	Condition.	Number of squares.	Dead.					Alive.				Weevils emerged.	Possible to emerge.	Remarks.
					Squares dry.	Larvæ.	Pupæ.	Weevils.	Total.	Larvæ.	Pupæ.	Weevils.	Total.			
1	Aug. 12	Ground.	.....	133	36.3	1.5	2.2	.....	.....	28	4	.....	.....	24	56	Counted just from field.
2	July 14	do....	.....	572	44	2	3	.....	.....	23	11	.....	.....	17	51	Do.
3	1904. July 8	do....	.....	1,522	57.6	.....	.....	3.4	.....	.....	.....	.....	.....	39	39	Allowed to emerge.
4	Sept. 11	do....	In shaded rows.	200	60	0.5	.....	.....	.....	.....	.....	.....	.....	39.5	39.5	Do.
5	Sept. 22	do....	do....	43	69	.....	.....	.....	.....	7	2	.....	.....	21	30	Partly allowed to emerge.
6	Sept. 21	do....	In sun....	210	64	32	1	.....	.....	0.6	1.4	.....	.....	0.5	2.5	Do.
7	do....	do....	do....	68	92.8	.....	.....	.....	.....	1.4	4.4	.....	.....	1.4	7.2	Do.
8	do....	do....	Squares brown.	100	61	18	3	2	.....	1	3	1	.....	10	15	Counted just from field.
9	do....	do....	Squares green.	268	65	5.6	1.5	0.7	.....	11	9	1.8	21.8	4.8	26.6	Do.
10	Sept. 11	Plants	do. ^a ..	400	59.5	1.8	0.5	6.8	.....	1	.....	.....	.....	30.5	31.5	Allowed to emerge.
Lots 6-10, weighted average.				1,046	63	10	1	3	77	5.4	3.1	0.5	9	14.8	.....	Sevendied in emerging.
Average of squares in which some stage is found.				.....	.....	26	3	8	37	14	10	1	25	39	.....	
11	1904. Oct. 5	Plants ^a .	Squares green.	100	44	.....	.....	.....	44	55	1	.....	56	0	.....	Counted just from field.

^aSquares picked from plants when just ready to drop.

The count made on October 5, 1904, fully confirms this. These squares were picked from the plants, taking those that would drop into the hand when touched, as in previous similar work. An immediate examination showed that 55 per cent contained live larvæ of various sizes, but mostly about half grown. Tho a few were ready to pupate, but one pupa was found, while there were 44 in which the work of young larvæ was clearly recognizable but in which no larva could be found. All squares showed egg punctures, but no eggs could be found in them.

The time at which the greatest mortality in the development of the weevil occurs is a matter of some practical importance and the data given in Table V throw considerable light upon this point. We have but few observations as to the mortality in the egg stage, but Hunter and Hinds state that but few eggs fail to hatch, which we have found to be the case in the laboratory. As the square receiving an egg does

not fall for about 10 days and remains green long after the hatching of the egg, which takes place in about 2.5 days, there seems no reason to suspect any considerable mortality at this period. After the infested squares have dried or decayed it becomes very difficult to find any trace of larvæ which die before they are half or two-thirds grown. The table shows that in about 63 per cent of the infested squares no trace of weevil stage could be found. In this percentage are the squares which had received feeding punctures only and a large number showing external signs of egg punctures, thus indicating that a great mortality occurs while the larvæ are less than half grown. Furthermore, it will be observed that of those individuals which pass the larval stage successfully 1.6 per cent died in the squares or while emerging. It has previously been shown that only about 1 per cent of squares placed where fully exposed to sunshine developed weevils. It would therefore appear that the mortality was largely due to the squares becoming so dried that the food supply was cut off from the young larva. Hence, it would seem that the sooner the square falls after being punctured, the higher will be the mortality, provided the ground is not shaded by close rows, and that any means for knocking off the squares before they would naturally fall, or a variety or strain of cotton which sheds its squares more quickly after being punctured, will be of decided advantage in increasing the mortality of the weevil. This seems to be even more marked where the squares are covered by the soil as is shown in Table VI.

TABLE VI.—Percentage of mortality of weevils in squares buried in soil.

Lot.	Date.	Depth buried.	Condition.	Number of squares.	Squares dry or decayed.	Per cent dead.					Per cent alive.			Per cent emerged.	
						Larvæ.	Pupæ.	Weevils in square.	Weevils in soil.	Total.	Larvæ.	Pupæ.	Weevils in squares.	From squares.	From soil.
1	Aug. 15	$\frac{1}{2}$ inch	Kept moist in laboratory.	a 25											40
2	do	1 inch	do	a 25											46
3	do	$1\frac{1}{2}$ inches	do	a 25											32
4	Aug. 29	1 inch	do	a 25	72	4			4						24
5	do	$1\frac{1}{2}$ inches	do	a 25	28		4		12	44					38
6	Sept. 21	$1\frac{1}{2}$ inches	In field	50	74	2				76	8				8
7	do	$2\frac{1}{2}$ inches	Rather dry	78	75		4	9		b 88	4		1		6
8	Sept. 11	4 inches	do	200						c 100					0
A	do	On surface	In sun	180	85	15									0
B	Sept. 18	do	do	174	62	26	12								0
C	July 15, 1904	do	Under screen	400	91										9
9	do	1 inch	Rather wet.	400	94.5				3						25
10	do	2 inches	do	400	81				10						9
11	do	3 inches	do	400	92.5				5						2.5
12	do	4 inches	do	400	95				3	0.5					1.5

a Contained larvæ or pupæ when buried.

b Dead weevils eaten by ants; squares green.

c Ants' nest just beneath.

It is frequently asserted that frequent cultivation is of value against the weevil in that the immature stages are killed by covering the squares with soil. The data given in Table VI hardly confirm this. Rarely will squares be buried over 1 or 2 inches. Lots 1, 2, 3, 4, 5, 9, and 10 show that the mortality in squares buried at this depth is about the same as under normal conditions. Lots 6 and 7 seem to show a benefit from burial, but these were placed in rather dry soil in the field in open sun, and when compared with lots A and B on the surface it is seen that the burying insured a greater per cent developing. It seems safe to say that in no case will burial for not over 2 inches result in any great mortality, and that in all probability the percentage of weevils developing will be greater than if left exposed to the sun on the surface. It is more frequently claimed that by plowing squares under deeply after a good rain the moist soil will rot them and the weevils will be unable to escape. Unfortunately we have no conclusive tests upon this point, but it would seem that a sufficiently deep plowing to bury squares 4 inches just after a rain would be such a decidedly bad agricultural practise as to possibly offset any benefit that might be derived from destroying the weevils in the squares buried.

RATE OF INCREASE OF THE WEEVIL.

Hunter and Hinds have shown that a female weevil normally lays some 150 eggs during an average of about 54 days, and that nearly one-half of the eggs are deposited during the first third of the period of oviposition. Allowing 24 days for the development of the average adult and 18 days for the oviposition of one-half of the eggs, they also estimate that the average length of a generation is about 42 days. The sexes of the weevil are produced in about equal numbers. With these factors as a basis we may easily compute that if on June 1 there were an average of 2 weevils to 100 stalks of cotton, on July 15, at the end of the first theoretical brood, there would be 50 weevils; and that, if one-half of these were females and the usual percentage survived, on September 1 there would be 1,250 weevils to 100 stalks. But these computations make no allowance for the mortality in the immature stages, and extended observations in the field show that such rapid multiplication does not really occur. It has been ascertained by the writer that the first brood of weevils rarely numbers more than five times the hibernated brood, and at College Station often but two or three times. At Vienna, in 1903, Mr. Teltschick picked 241 weevils from his trap rows up to June 1, while on June 1 to 7, 15, and 22 he picked 759 weevils on the same area. This doubtless represents very accurately the increase of the first brood over the hibernated weevils, showing an increase of 315 per cent. It is of course probable that some weevils had left the trap rows for the planted cotton, which was barely commencing to square

on June 22, but the number would have been comparatively small and the end of the generation was probably considerably later, so that an increase of ten times, or 1,000 per cent, would be a conservative estimate. The largest number of weevils at College Station early in July was found on Eckol's cotton, which was planted very early, on July 14, 1904, when there were 27 weevils to 100 stalks. This field was adjoining a gin and 1 mile away, on Ayer's cotton, there were but 15 weevils to 100 stalks. On the same date, on the Brazos River, there were but 10 weevils to 100 stalks, and on our experimental plats, where the stalks were destroyed the previous fall, the hibernated brood had numbered barely 1 weevil to 100 stalks. There were but 3.3 weevils of the first brood to 100 stalks. Accurate figures for the rate of increase from the first to the second brood are not available, but from general observations and from reports of the injury done by the second brood, as compared with the first, it is safe to assert that the rate of increase is not materially greater for the second brood than for the first. The rate of increase of the third brood seems to be decidedly greater, but, as the late-developing individuals of the second brood and the first of the third brood more or less overlap, it is difficult to determine this accurately in the field. However, the total increase at the appearance of the third brood over the number of hibernated individuals can be given in one or two cases. Along the Brazos River, in 1903, there were but 2 weevils to 100 stalks on June 17, and on August 25 47 weevils to 100 stalks, or an increase of twenty-three times between these dates, the collection at the latter date probably representing part of the fourth brood. In 1903, at the college on our experimental plats, there were 5.5 weevils to 100 stalks on August 13 where there were 1.5 on June 18, representing the hibernated brood. The greatest increase we have observed from the hibernated brood until the middle of August was on the plat of the experiment station at the college barn in 1903, where there were 5 hibernated weevils to 100 stalks on June 18 and 233 on August 13, or an increase of forty-seven times. From a careful study of the data it seems safe to assert that the usual rate of increase from the second to the third brood is not over ten or fifteen times in this section, as there is usually not over 1 weevil to the stalk of cotton until after mid-August. It will be seen, therefore, that tho the theoretical increase of the weevil, based upon a careful study of its habits and the mortality as far as can be ascertained, would show an increase of twenty-five times from between the first and second and second and third theoretical broods of 42 days each from June 1 to September 1, as a matter of fact, during the first period mentioned, the increase up to and including the second brood, emerging about the third week in July, is usually considerably less than twenty-five times the hibernated brood—probably not over fifteen times—and that the total increase

from the 1st of June to the 1st of September is only about fifty times, certainly not over sixty-five times, where theoretically it would be six hundred and twenty-five times. The reason for this discrepancy is unknown to the writer, but is a fact for which the cotton planter should be decidedly thankful. It may be that the mortality of the immature stages of the weevil in the squares is greater than the count of thousands of squares has shown, that many of the adult weevils die or are destroyed before reproducing, or that the number of eggs laid and the length of the period of oviposition in the field are much less than those observed in the laboratory. That this is true of the hibernated brood is shown on page 12. It would seem that the discrepancy is mostly due to the two latter factors. This discrepancy but emphasizes the necessity for accurately observing the field conditions on a very large scale in different fields in different sections of the State constantly thruout the season if we are to obtain accurate knowledge of the true habits, rate of increase, and injury of the boll weevil, as it occurs in the field.

To summarize briefly, it would seem that if there be 2 weevils to 100 stalks of the hibernated brood, then by early in August there will be a sufficient number of weevils to stop the blooming of the cotton. Furthermore, with the normal increase it seems that in about a month after 4 or 5 weevils are found on 100 stalks, there will have been sufficient increase to prevent further fruiting of the cotton, and there will then be from 75 to 100 weevils to 100 stalks. The utter impossibility of making a cotton crop where a large percentage of the weevils survive the winter will therefore readily be seen unless exceptional measures can be taken to check their multiplication. Weather conditions unfavorable to the development of the weevils are decidedly the most important controlling factors, and that such conditions not infrequently occur is shown by the reports of voluntary observers in southern Texas in 1904.

INJURY TO SQUARES IN RELATION TO THE NATURAL INCREASE OF SQUARES.

The formation of squares upon the cotton plant depends upon so many different factors that it is exceedingly difficult to make any general statements regarding the increase in their numbers. Thus the character of the soil, the nature of the variety of cotton, and the climatic conditions prevailing all influence the formation of squares. It may be clearly seen from Tables VII to X that some varieties form squares much faster than do others, and that between the same dates the same variety will not produce the same number of squares in different places. However, from an examination of the tables we may form some idea of the natural increase of the squares early in the season during the critical period of fruit formation. During the 2

weeks following the formation of the first 2 squares the number of squares will increase ten or twelve times; in other words, there will be from 20 to 25 squares; and during the next 2 weeks this number will increase two times, or at the end of the month there will be about 40 squares, or about twenty times as many as at the beginning of the month, when there were but 2 squares. At the end of the second month there will be an increase of about two times over the first month, or there will be approximately 100 squares to the plant. During the first third of the third month the number of squares usually remains about constant, but after that, tho squares are constantly forming, there is a tendency to decrease for a time.

TABLE VII.—*Progress of infestation by boll weevil and production of fruit upon cotton plats at College Station, Tex., in 1903.*

Variety.	Date of examination.	Number of stalks.	Squares.				Blooms.		Bolls.				Wee- vils.	Yield per acre.						
			Total per plant.	Total punctured.	Per cent punctured.	Dropped.	Total.	Per plant.	Perfect.	Open.	Total per plant.	Punctured.		Total.	Per 100 stalks.	Pounds of seed cotton.				
																Date.	First picking.	Date.	Second picking.	Total.	Bales.
Jones Im- proved..	June 18	20	$\frac{1}{2}$																	
	July 11	25	9	2	0.9		8	0.3	1											
	July 27	30	51	11	.7		37	1.2	138		4.6									
	Aug. 12	10	21	19	9.1	70	31	3	126	12										
	Sept. 5	5	34	90	56	127		0	25	6	6	7	1	20	Sept. 17	104	Oct. 20	98	202	
Allen	June 18	20	1.5																	
	July 11	25	9			23	1	12		5										
	Aug. 12	10	35.2	125	35	50	38	3.8	208	24	30			Sept. 17	178	Oct. 20	80	258		
Excelsior	June 18	20	1.8																	
	July 11	25	8.3	1	.4	11	.5	10		4										
	Aug. 12	10	44.7	59	13	42	31	3	119	12	6									
	Sept. 5	5	20.5	132	64	110			4	8	6	20	4	80	Sept. 16	172	Oct. 20	92	264	
Parker	June 18	20	1.9																	
	July 11	25	11			11	.5	11		5										
	Aug. 12	10	36.8	55	15	97	47	4.7	211	22	6			Sept. 16	184	Oct. 20	60	244		
Griffith....	June 18	20	1.5	2	6.3								2	10						
	July 11	25	9	14	6		13	.5	6		24									
	Aug. 12	10	28.9	62	21	74	31	3	69	8.5	16	3	30	Sept. 17	136	(?)	(?)	(?)		
King	June 18	20	2.5																	
	July 11	25	12	1		13	.5	24	1											
	July 27	50	72.6	31	.8	6	12.7	2.5	486	9										
	Aug. 12	10	47.5	57	12	97	51	5	233	23	6	3	30							
	Sept. 5	5	57	144	51	160			20	40	17	25	11	220	Sept. 16	290	Oct. 20	68	358	

TABLE VIII.—Comparison of progress of infestation by boll weevil and production of fruit upon variety plats on Carson & Smith's plantation, Brazos River, Wellborn, Tex., in 1903.

Plat.	Variety.	Date of examination.	Number of stalks examined.	Squares per plant.			Blossoms per plant.	Bolls.		Weevils per 100 stalks.	Yield per acre.				
				Number.	Punctured.	Per cent punctured.		Per plant.	Per cent punctured.		Pounds seed cotton.			Bales.	
											First picking, September 23.	Second picking, October 27.	Total.		
1. . .	Native	June 26.	100	1.6	0.01	0.6									
		July 17.	50	12.0	.04	.3	0.14	0.06	0.0						
		Aug. 17.	10	65.0	3.5	5.3	1.9	16.9	.0						
		Aug. 25.	5	70.0	36.0	51.4	2.6	21.2	9.4	20					
2.	Territory	June 26.	100	1.0	0	.0					270	172	442	.27	
		July 17.	50	8.0	.04	.4	.08	.3	.0						
		Aug. 25.	5	99.0	33.8	34.1	3.0	21.0	11.0						
3.	Dickson	June 26.	100	.75	0	.0					163	121	284	.17	
		July 20.	50	28.0	.08	.3	.48	.92	2.1						
		Aug. 17.	10	98.0	7.8	7.9	3.2	23.9	.4						
		Aug. 25.	5	92.0	39.6	43.0	2.0	26.6	.0	40					
4.	Schley	June 26.	100	.32	0	.0									
		July 20.	25	20.0	.08	.4	.2	.4	.0						
		Aug. 17.	10	70.0	4.5	6.4	2.4	8.3	.0						
		Aug. 25.	5	94.0	41.6	44.4	3.0	15.0	.0	60					
5.	Bohemian	June 26.	100	.73	0	.0									
		July 20.	25	16.0	.04	.2	.16	.2	.0						
		Aug. 17.	10	80.0	7.0	8.7	2.1	15.4	.0						
		Aug. 25.	5	144.0	81.0	56.2	2.0	27.8	14.7	80					
3, 4, 5. 7.	King	June 26.	100	2.5	.03	1.1								a 340	.21
		July 20.	25	58.0	.16	.3	1.52	2.44	.0						
		Aug. 25.	5	104.0	40.2	38.6	2.0	42.0	.0	80					
8.	Shine	June 26	100	2.96	.0	0.0					b 509	491	b 1,000	.65	
9.	do.	do	100	3.28	.0	0.0									
8-9.	do.	July 20	25	65.0	0.36	.5	1.40	3.6	.0						
8.	do.	Aug. 25	5	90.0	37.4	41.5	3.8	52.0	.04	40					
8-9.	do.	do									476				
10.	Shine	June 26	150	3.3							1,471		1,948	1.21	
11.	do.	do	150	1.6											
12.	do.	do	150	2.2	.0	0.0									
13.	do.	July 17	50	54.0	.3	.5	.64	1.58							
12-13.	do.	June 26	150	2.9	.01	.45									
10-13.	do.	July 17	50	61.0	.08	.1	1.2	1.96							
14.	do.	Aug. 17	10	109.0	6.8	6.2	2.6	32.3	.02	10					
		do											a 1,000	.65	
15.	do.	June 26	100	4.7	1.0	2.1									
15-16.	do.	July 17	25	110.0	.44	.4	1.4	4.88							
17.	Wellborn	Aug. 25	4	106.0	33.9	32.0									
15.	do.	July 20	25	42.0	.28	.5	.48	.52		(?)	625	603	1,228	.76	
15-16.	do.	Aug. 25	5	195.0	79.8	40.9	4.0	71.4		100	272	413	710	.43	
17.	Wellborn	June 26	100	3.6	.0	.0									
		July 20	25	52.0	.44	.8	.92	1.92							
		Aug. 25	5	109.0	52.8	48.4	1.4	100.6		(?)	494	672	1,167	.73	

a Average.

b About.

TABLE X.—Comparison of progress of infestation by boll weevil and production of fruit upon plats of cotton at College Station, Tex., in 1904.

Variety.	Date of examination.	Number of stalks.	Squares.				Blooms.		Bolls.			Weevils.		Yield per acre.							
			Total per plant.	Total punctured.	Per cent punctured.	Dropped.	Total.	Per plant.	Perfect.	Open.	Total per plant.	Punctured.	Total.	Per 100 stalks.	Pounds seed cotton.						
															Date.	First picking.	Date.	Second picking.	Total.	Bales.	
Jones's March planting.	May 22	2,500	...	...	...	...	...	...	...	...	...	2	0.08	...	...	...	...	...	...	...	...
	May 30	2,500	...	...	...	...	...	...	...	...	...	2	.08	...	...	...	...	...	...	...	...
	June 17	400	5.5	36	1.6	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	June 9	320	...	...	...	...	...	...	...	...	...	3	.9	...	...	...	...	...	...	...	...
	June 15	400	...	...	...	...	...	...	...	...	...	2	.5	...	...	...	...	...	...	...	...
	June 27	400	15	12	.2	0	174	0.43	55	...	0.13	...	0	0	...	...	...	...	...	...	...
	July 13	50	39	7	.35	34	166	3.3	307	...	6.1	...	1	2	...	...	...	...	...	...	...
	Sept. 12	25	4.5	98	86	(a)	0	...	455	22	108	...	36	144	Aug. 28	258	Sept. 14	252	510	.32	...
	May 22	2,500	...	...	...	...	...	...	...	...	...	...	1	.04	...	...	...	...	...	...	...
King Imp. planting.	May 30	2,500	...	...	...	...	...	...	...	...	...	10	.4	...	...	...	...	...	...	...	...
	June 9	320	...	...	...	...	...	...	...	...	...	3	.9	...	...	...	...	...	...	...	...
	June 15	2,500	...	...	...	...	...	...	...	...	...	5	.2	...	...	...	...	...	...	...	...
	June 17	400	4.8	21	1.2	1	...	...	...	...	...	(a)	...	...	...	...	...	...	...	...	...
	June 27	380	22	14	.2	92	164	.43	91	...	.24	...	0	0	...	...	...	...	...	...	...
	July 13	50	43	18	.83	38	178	3.8	309	...	6.2	...	2	4	...	...	...	...	...	...	...
	Sept. 12	25	6.5	142	86	(a)	...	...	491	23	83	...	46	184	Aug. 27	313	Sept. 10	348	661	.4	...
	May 22	1,200	...	...	...	...	...	...	...	...	...	...	4	.3	...	...	...	...	...	...	...
	May 30	1,200	...	...	...	...	...	...	...	...	...	...	14	1.1	...	...	...	...	...	...	...
Bennett's ^b Apr. planting.	June 17	50	9.7	25	5.1	7	0	...	...	...	...	(a)	0	...	...	...	...	...	...	...	...
	June 9	250	...	...	...	...	...	...	...	...	...	2	.8	...	...	...	...	...	...	...	...
	June 27	400	25	152	1.5	8	53	.13	...	...	...	0	0	...	...	...	...	...	...	...	...
	July 13	50	33	19	1.1	47	243	4.8	226	...	4.5	...	2	4	...	...	...	...	...	...	...
	Sept. 12	25	1.3	27	84	(a)	0	...	700	31	90	...	37	148	...	...	...	...	...	...	...
	June 7	200	0	0	...	...	...	...	...	...	...	...	0	...	...	...	...	...	...	...	...
	June 17	200	...	3	...	...	...	...	...	...	...	...	2	1	...	...	...	...	...	...	...
	Sept. 16	25	1.8	34	79	(a)	0	...	217	10	36	...	24	96	...	...	...	...	...	...	...
	June 7	275	...	29	...	...	...	...	...	...	...	...	2	.7	...	...	...	...	...	...	...
Native.	June 17	200	...	32	...	...	...	...	...	...	...	...	7	3.5	...	...	...	...	...	...	...
	June 29	290	20	111	3.8	113	...	...	190	...	...	...	0	0	...	...	...	...	...	...	...
	June 7	530	...	55	...	...	...	...	...	...	...	...	8	1.5	...	...	...	...	...	...	...
	June 17	200	...	61	...	1	...	...	...	...	...	...	21	10	...	...	...	...	...	...	...
	June 29	364	16	128	2.7	137	...	...	156	...	...	...	0	0	...	...	...	...	...	...	...
	Sept. 16	25	2.8	65	91	(a)	...	...	147	7.4	39	...	32	128	...	...	...	...	...	...	...
	June 18	100	25	22	1.1	6	...	...	...	...	...	...	6	6	...	...	...	...	...	...	...
	July 14	40	63	1140	44	395	65	1.6	537	...	13	...	6	15	...	...	...	...	...	...	...
	Sept. 16	25	3.2	71	88	(a)	...	...	265	14	85	...	31	124	...	...	...	...	...	...	...
Native.	June 14	50	22	47	6.1	22	583	...	...	...	...	...	7	14	...	...	...	...	...	...	...
	June 29	398	41	30	1.1	154	...	...	616	...	...	...	0	0	...	...	...	...	...	...	...
	July 14	40	18	437	57	121	55	1.4	419	...	...	...	11	27	...	...	...	...	...	...	...
	Sept. 16	25	9.5	219	92	(a)	...	...	211	11	72	...	46	184	...	...	...	...	...	...	...

^a Not counted.^b Consisted of a large number of varieties.

NOTE.—The five plats of native cotton referred to were planted by different farmers in the vicinity of College Station.

The proportion of squares punctured by the end of the first month after squares have commenced to form has been found to range from 2.5 to 10 per cent. It is usually not over 5 per cent, and an average proportion of 3 per cent would be more nearly correct. Thus, on the Brazos River, July 13, 1904, but 8 per cent of the squares were punctured. At Eckol's, on June 14, 1904, 6.1 per cent were punctured and on June 29 but 1.1 per cent. In 1903 at the College not over 2 per cent were punctured during the first month of square formation. In the Brazos bottom in 1903 the proportion was less than 1 per cent. In 1901, on June 17, Mr. Teltschick reported to Professor

Mally that 10 per cent of the squares were punctured upon cotton which had been squaring for 5 weeks. At the end of the second month of square formation there is an increase of from ten to fifteen times in the percentage of punctured squares. On August 13, 1903, an average of 35 per cent of the squares on our plats were punctured, and on August 25 on Smith & Carson's plantation there were 42 per cent. On August 13, on the experiment station plat at the College barn, there were 65 per cent, these representing the injury done upon the emergence of the third brood of weevils. On July 14, 1904, Eckol's and Ayer's cotton had 57 and 44 per cent punctured, this being about 2 months after the first squares formed. In a general way, it seems safe to say that usually 50 per cent of the squares will be punctured by about 2 months after the cotton commences to square, at which time, as we have seen, there would normally be about 100 squares to the stalk. With the appearance of the third brood of weevils early in August the percentage of injury rises rapidly, and by September 1 from 85 to 90 per cent of the squares will be found punctured, tho it is rather unusual to find over 90 per cent of the squares punctured in this section when they are carefully counted. In 1904, at the end of 6 weeks of square formation, there were but 8 per cent of the squares punctured along the Brazos River, tho on the oldest cotton, which had been squaring about 2 months, where the weevils were thickest, 40 per cent were punctured. When one-half of the squares are punctured it may be readily concluded that there are probably sufficient weevils present to prevent any more squares from forming fruit. It will be seen, therefore, that the critical period in the relation between natural increase of squares on the plant and the increased injury by the boll weevil is during the period of 6 to 8 weeks after first squaring, which usually coincides more or less closely with the time between the appearance of the second and third broods of weevils. Thus, if we consider 6 weeks as the average time required for cotton to begin to square after planting, it will be seen that the bulk of the fruit must be set in 85 or 90 days after planting. In other words, it may be readily seen that to escape injury by the boll weevil cotton must be so grown that the bolls will commence to open in about 100 days after planting, and that all the fruit which will probably be secured must be set within 45 days after the squares begin to form. The advantage of early planted cotton and rapid maturing varieties becomes, therefore, very apparent.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—BULLETIN NO. 63, Part II.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

NOTES

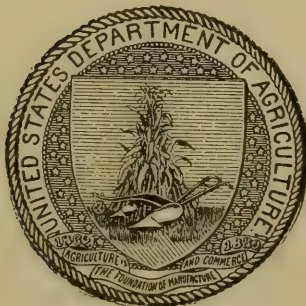
ON THE

BIOLOGY OF CERTAIN WEEVILS RELATED
TO THE COTTON BOLL WEEVIL.

BY

W. DWIGHT PIERCE,
Special Field Agent.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., September 19, 1906.

SIR: I have the honor to submit a manuscript entitled "Notes on the Biology of Certain Weevils Related to the Cotton Boll Weevil," prepared by Mr. W. Dwight Pierce, special field agent in this Bureau. A number of weevils more or less closely related to the boll weevil occur in the United States and there seems a possibility that from some of them parasites may be obtained which may be induced to transfer their attacks to that destructive pest. The present paper gives some results of investigations carried on during the year 1905, and I recommend its publication as Part II of Bulletin No. 63 of the Bureau of Entomology.

Respectfully,

F. H. CHITTENDEN,
Acting Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

NOTES ON THE BIOLOGY OF CERTAIN WEEVILS RELATED TO THE COTTON BOLL WEEVIL.

By W. DWIGHT PIERCE,
Special Field Agent.

INTRODUCTION.

During the year 1905 considerable knowledge was gained concerning the biology of Texas weevils. The practical importance of this information lies in the possibility that from some of these species parasites may be artificially induced to transfer their activities to the boll weevil (*Anthonomus grandis* Boh.). But it has a further interest in that it makes possible a comparison between the life history of this important enemy of cotton and that of related insects which normally inhabit regions into which that pest has only recently made its advent.

Anthonomus grandis breeds during the entire growing season, from April to October, and on one plant—cotton. Its host plant is so plentiful that there is a constant food supply. *Anthonomus signatus* Say, which breeds in immense numbers in the flowers of strawberry, blackberry, dewberry, and redbud, is not known to have more than the short period of activity limited by the fruiting of its host plants. Hence the possibility of transferring parasites would be limited to a short period and there would be further difficulties on account of the local distribution of the food plants. *Anthonomus xeneotinctus* Champ., which has been found to breed in enormous numbers in pepper, in western Texas, is not known to occur on other food plants in the spring and early summer, inasmuch as only a part of its cycle of life has been determined.

These three species are the most important of the Texas economic Anthonomi, and from the two latter little may be expected in assisting in the control of the boll weevil, altho it may be important to suggest

that the parasites of *Anthonomus signatus* might attack *Anthonomus æneotinctus* if the strawberry and pepper were grown side by side. The former weevil has long been established and has numerous parasites. The latter has not been here long and has not extended its foothold greatly, neither has it many parasites. Both of these species are small, and perhaps not likely to yield parasites which would attack larger species.

Of the large species equaling the boll weevil in size some may, perhaps, yield favorable results. *Anthonomus fulvus* Lec. gives promise in one way because it breeds in the buds of *Callirrhoe involucrata*, a mallow closely related to cotton. But this plant ceases flowering early in July, which would make transfer of parasites difficult. The biology of this species is extremely like that of the boll weevil, and it would appear to be easier for parasites to change from it to its more injurious relative than from the two species mentioned before: *Anthonomus squamosus* Lec., which breeds along the western edge of the cotton belt in the flowers of *Grindelia squarrosa nuda*, is much more abundantly parasitized than *A. fulvus* has proven to be. Its food plant has a long season, so that several generations are produced. Both of these species seal the egg puncture and pupate in a cell formed by the larval excrement, just as does the boll weevil. Both are parasitized likewise by *Bracon mellitor* Say, a parasite of *Anthonomus grandis*. *Eurytoma tylodermatis* Ashm., listed as a parasite of *Anthonomus grandis*, is a primary parasite of *Lixus musculus* Say and probably also of *Anthonomus squamosus*. Another species of *Eurytoma* was definitely bred from *A. squamosus*. *Anthonomus scutellaris* Lec. is known to breed in wild plums in Texas. *Desmoris scapalis* Lec., a weevil very similar in habits to the boll weevil, breeds in the flower heads of *Sideranthus rubiginosus*, thus resembling *A. squamosus*, but differing from the *Anthonomi* mentioned, in that it undoubtedly pupates in the ground. This species is very abundant in the heart of the weevil-infested area of the cotton belt and occurs thruout a considerable part of the summer. Moreover, it is often parasitized.

Of the smaller species those to be noticed are not smaller than the smallest of *A. grandis* and *A. squamosus*. *Anthonomus disjunctus* Lec., like the latter, breeds in the flower heads of *Heterotheca subaxillaris*, a common composite thruout central Texas. It is very numerous and considerably parasitized. *Anthonomus æneolus* Dietz breeds abundantly in the buds of *Solanum rostratum*, which occurs thruout Texas. *Catolaccus incertus* has been bred as a parasite.

The nature of the problem being thus set forth, it will be readily understood that the primary requisite is a knowledge of the breeding habits of as many species of weevils as possible.

The following notes bear upon the biology of certain of the Texas weevils. The determinations are by Messrs. E. A. Schwarz, W. H. Ashmead, D. W. Coquillett, August Busck, and W. E. Hinds, in those groups respectively in which they are specialists.

ANTHONOMUS DISJUNCTUS Lec.

This species was found breeding in large numbers on *Heterotheca subaxillaris* at Jacksonville, Tex., by Mr. C. R. Jones and the writer. It oviposits in the bud at the base thru the involucre. The presence of the weevil is indicated by the blackening of the two or three involucral bracts which were punctured. The larva feeds among the seed in the seed-head, and forms a compact cell of its exuviae. Here it pupates and the adult emerges from the dried head.

PARASITES.

Three pteromalids were bred from a few buds brought in to the laboratory.

ANTHONOMUS FULVUS Lec.

Mr. W. W. Yothers has carried out an extensive series of notes on the biology of *Anthonomus fulvus* incident to his finding the host plant of this species. On June 9 the first weevils were taken, and found to be very abundant on the flowers of the purple mallow, *Callirrhoe involucrata*. This was, then, the weevil that had been sought so long—a native insect infesting a close relative of the cotton, and with life history parallel in all details to that of the boll weevil. The questions at once arose as to whether the new weevil was held in check by parasites which might be transferred to the boll weevil, whether it had more than one host plant, whether it would feed on cotton, and whether the boll weevil would feed on the mallow.

The work of the season of 1905 answered some of these questions, but not the one of primary interest. Only one parasite was bred, viz, *Bracon mellitor*, already known as a primary parasite of *Anthonomus grandis*. If this parasite was not originally parasitic on *A. grandis* and was so on *A. fulvus* we may reasonably expect that any other primary parasite of the latter may be induced to transfer its energies against the former.

The host plant, *Callirrhoe involucrata*, is largely distributed over the Mississippi River basin, and its guest, *Anthonomus fulvus*, is known by previous record to occur in Kansas and by observations of this laboratory to breed at Ardmore, Ind. T. (C. R. Jones, collector), and Dallas and Victoria, Tex. Thus it is highly probable that the weevil's range is at least coextensive with the range of this host plant.

The plant is a spring bloomer, thriving in May and June in Texas and gradually later toward the north. According to the laboratory

records, the weevil's activity is probably limited to the flowering activity of the plant, after which it goes into estivation and hibernation.

The weevil generally oviposits in the bud, altho perhaps also in the ovary. The egg puncture is immediately sealed, just as by *Anthonomus grandis*. Owing to the brief period from bud to flower the metamorphosis is comparatively rapid. The only observation on this point limited the pupa stage to less than 4 days. The egg is lemon-yellow, elliptical, measuring 0.375 mm. in breadth and 0.484 mm. in length. It is placed among the anthers, generally near the base of the floral column. Incident to the act of oviposition the petals become sealed by the released juices and are prevented from fully opening, so that the developing weevil is still protected from its enemies. Larvæ or pupæ are often found thus in the sealed flower, and are sometimes still in this part after it has dropt. On the other hand the larvæ frequently eat into the ovary and there construct a pupal cell of their excrement. The weevils may oviposit in the ovary, altho no definite record was obtained. The ovaries are largely infested by a very small weevil, which is as yet undetermined. After June 9 neither copulation nor oviposition was observed.

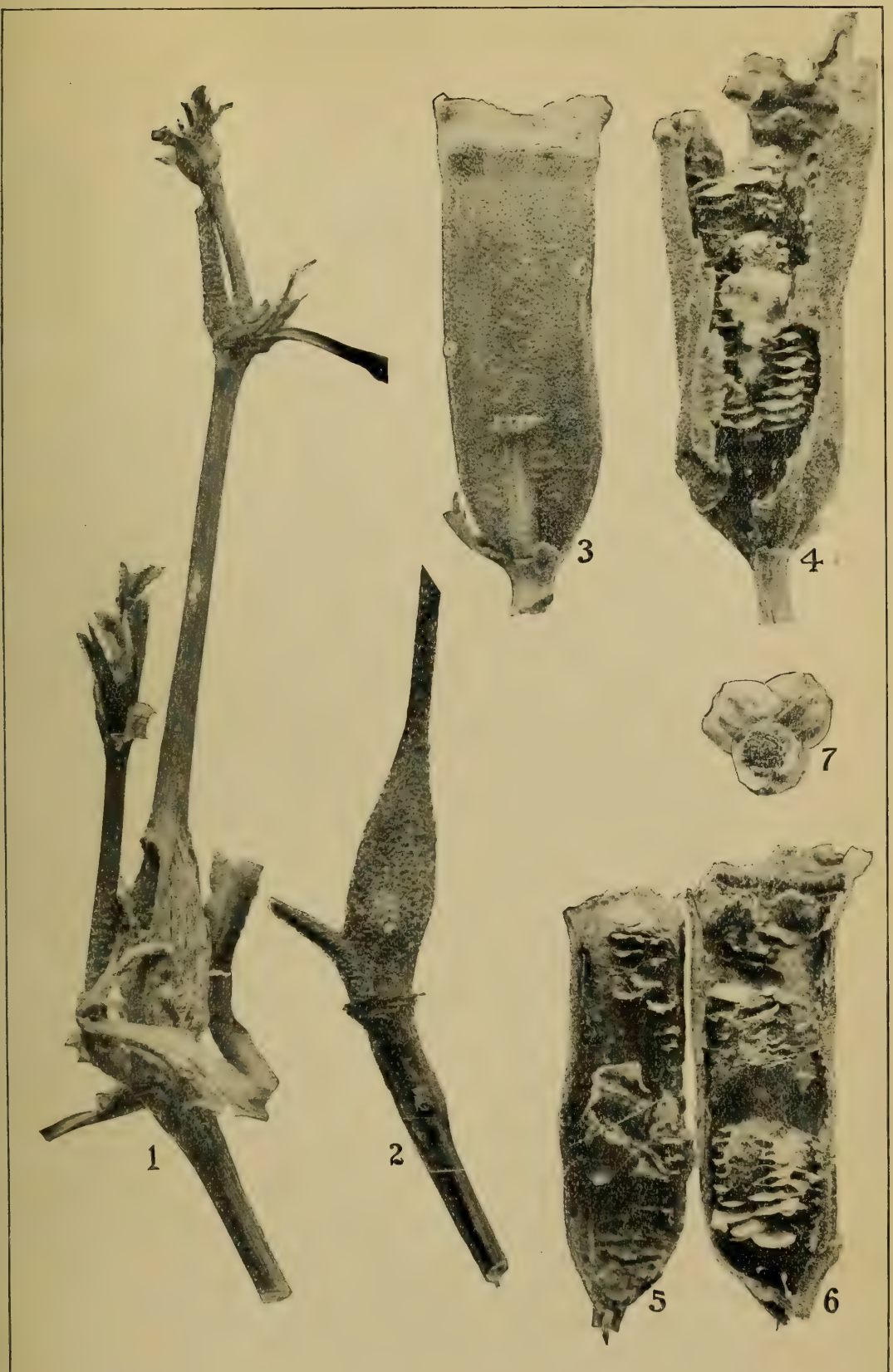
July 4 was the last date of finding larvæ in the field. Thirty-two flowers had but two larvæ, and two showed feeding punctures. On July 1 seven adults were taken in the field. The Callirrhoe ceased blooming about July 10. As the weevils in the breeding cages ceased to feed on the flowers early in July, they were placed with a plant in a large breeding cage for estivation on July 27. The Callirrhoe plants were induced to bloom until about November 1 by transplanting, but the weevils did not seem inclined to feed again. A weevil which had not fed for a month was still active August 9, and on August 16 was observed to feed on the flowers of the host plant.

The weevils normally feed on the anthers and on the surface of the petals. They refused to touch the foliage. When offered a choice of Callirrhoe or cotton blooms, they almost invariably went directly to the former. When given cotton alone they were observed to feed on the pollen and petals and in one case indication of feeding on the square was observed.

In habit the weevil is like *Anthonomus grandis*. It is susceptible to movement and when conscious of a disturbance remains alert on the edge of a petal. A slight movement will cause it to drop to the ground, where it is almost impossible to find it. It is a very ready flyer and goes from plant to plant in this manner.

ANTHONOMUS SQUAMOSUS Lec.

This species was found breeding in very large numbers by Mr. C. R. Jones and the writer on *Grindelia squarrosa nuda* at Clarendon, Tex. It has previously been recorded from the same plant in Colorado and



WORK OF LIXUS MUSCULUS AND ORTHORIS CROTCHII.

Fig. 1.—Gall of *Lixus musculus* and exit hole of adult on stem of *Polygonum pennsylvanicum*.
 Fig. 2.—Gall of *Lixus musculus* and entrance hole (closed) of pyralid caterpillar on stem of *Polygonum*.
 Fig. 3.—Pod of *Mentzelia nuda*, showing two egg punctures of *Orthoris crotchii*.
 Fig. 4.—Pod of *Mentzelia* opened, showing a cluster of *Orthoris crotchii* cells, and the cocoons of *Tetrastichus*.
 Figs. 5, 6.—Interior of pod of same, showing several cells of *Orthoris crotchii*.
 Fig. 7.—An isolated cell of *Orthoris crotchii*, showing the manner in which the seeds are eaten. (Original.)

what was supposedly the same species from *Helianthus* in Kansas. It oviposits in the bud or flower at the base thru the involucre. The presence of the weevil is indicated by the blackening of the two or three punctured involucre bracts. The larva feeds among the ovaries in the flower head and forms a compact cell from its exuviae. This cell is the more compact because of the sticky nature of the flower. Here it pupates and matures, the adult emerging from the dry seed head. The specimens secured differ greatly in size, color, and vestiture.

PARASITES.

Bracon mellitor Say was bred in large numbers from the larvæ.

Eurytoma tylodermatis Ashm. was bred in large numbers as a primary parasite.

Catolaccus sp. One specimen of this genus was bred, and is presumably a primary parasite.

An undetermined noctuid caterpillar, which eats out the heads of the *Grindelia*, destroys all weevils breeding in the flowers it attacks.

LIXUS MUSCULUS Say. (Pl. I, figs. 1, 2.)

This species was found by Mr. C. R. Jones and the writer breeding in considerable numbers in the stems of *Polygonum pennsylvanicum* at Clarendon, Tex. It oviposits near the joints of the stem, and the young larva as it feeds causes the stem to enlarge and form a gall-like cell. These galls are twice the diameter of the stem and about three-quarters of an inch long. The growing weevil fits its cell tightly, and consequently, after maturing, it takes some time for it to gain an exit. The adult gnaws a round hole in front of its head and then gradually forces itself out.

PARASITES.

Glyptomorpha (*Bracon*) *rugator* Say. One adult was bred from the weevil and numerous pupæ were found in the cells. The pupa is inclosed in a brown papery cocoon, which completely fills the cell and crowds the remains of the *Lixus* against the wall.

Eurytoma tylodermatis Ashm. was bred as a primary parasite.

Neocatolaccus tylodermæ Ashm. was bred as a primary parasite. This species has been bred also from boll-weevil-infested squares.

Cerambycobius cyaneiceps Ashm. One specimen was bred from an infested stem, and is probably a *Lixus* parasite.

Eurytoma tylodermatis Ashm. One individual bred from an infested stem and probably a parasite of *Lixus*, tho perhaps hyperparasitic.

A pyralid larva which dwells in the stems of this plant seems to be very fond of this weevil, as it not only eats those which lie in its path but has been frequently seen to cut a hole into the galls from the outside

and to feed on the inmate. It makes no choice of the stage of the weevil to be eaten; larvæ, pupæ, and adults have been found partly devoured.

ORTHORIS CROTCHII Lec. (Pl. I, figs. 3-7.)

This species was found by Mr. C. R. Jones and the writer breeding in *Mentzelia nuda* at Clarendon, Tex. It oviposits in the ripening seed pods, and the larva makes its cell in the center of six or seven of the flat transverse seeds. Very often four or five weevil cells will lie side by side, occupying a large part of the interior of the pod. The cells are made up of the exuviae of the larvæ. Exit is secured thru the open apex of the ripe pod.

PARASITES.

Microbracon (Bracon) nuperus Cress. was bred in very large numbers as a primary parasite. The air around the *Mentzelia* bushes was thick with individuals of this and the next species. Several definite records of hyperparasitism by *Tetrastichus* were obtained. The latter construct beautiful little white cocoons, and several feed on one host.

Tetrastichus sp. A very large number of these specimens were bred from the *Mentzelia* pods, and several very definite cases of primary parasitism were recorded.

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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY—BULLETIN No. 63, Part III.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

AN ANT ENEMY OF
THE COTTON BOLL WEEVIL.

BY

W. E. HINDS,

In Charge of Cotton Boll Weevil Laboratory.

ISSUED FEBRUARY 5, 1907.



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., November 21, 1906.

SIR: I submit herewith manuscript of a paper on an ant enemy of the cotton boll weevil, by Dr. W. E. Hinds, which I recommend for publication as Part III of Bulletin No. 63. The account of this well-known cotton ant is of especial interest, since it seems to be a much more important enemy of the cotton boll weevil than has heretofore been supposed.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

AN ANT ENEMY OF THE COTTON BOLL WEEVIL.

(*Solenopsis geminata* Fab. var. *xyloni* McC.)

By W. E. HINDS,

In Charge of Cotton Boll Weevil Laboratory.

INTRODUCTION.

That native species of ants are the most important predatory enemies of the boll weevil is an admitted fact, but the real extent of their beneficial work has probably been underestimated rather than overestimated. Several species have been found attacking the weevil in some of its stages, but by far the most important one as yet observed is a rather small species determined by Dr. W. M. Wheeler as *Solenopsis geminata* Fab. var. *xyloni* McC. This ant is quite variable in size and color, and the different forms found in Texas have been separated into several varieties. As it is probable that the food habits are similar in each of these forms, the varietal distinctions need not be emphasized here.

Doctor Wheeler has kindly furnished the following information:

The species is common everywhere in the warmer parts of the world, and is both highly carnivorous and highly vegetarian; that is, it will prey on any defenseless or moribund insects, and stores seeds in the chambers of its nest. It stings very severely, whence the name "fire-ant" or "*Hormiga brava*," which is given it in Spanish America. The dark variety you sent is common in the black soil, such as one finds in cotton fields. I have seen it in great abundance in the vicinity of Austin, Tex.

DESCRIPTION.^a

For the present purpose this ant may be characterized as follows:

There are two distinct nodes or scales in the slender petiole of the abdomen. All forms but the male have a sting. The antennæ are ten-segmented; the club is formed of the last two segments, of which the terminal one is the longer. Maxillary and labial palpi have each two segments. The clypeus has two longitudinal ridges and the sting is very large. The color varies, but the workers usually seen are of a dark reddish brown, the color of the abdomen being often considerably darker than that of the head and thorax. Length of workers from 2 to 3 mm.

^a For illustration of the species see Bul. 51, Bur. Ent., U. S. Dept. Agric., fig. 8, p. 149.

AN ENEMY OF THE COTTON LEAF-WORM AND BOLLWORM.

This species has long been known as an important enemy of the cotton leaf-worm (*Alabama argillacea* Hbn.), what is probably the first notice of its good service in this connection having been published in 1847. Since that time so many observers have reported it as attacking the eggs, larvæ, and pupæ of the leaf-worm that there can be no doubt of the substantial accuracy of the conclusion that it is one of the most important predaceous enemies of that cotton pest.

While less study has naturally been given to the relationship of ants to the cotton bollworm than to the leaf-worm, it has been shown repeatedly that the species under consideration preys upon both the eggs and larvæ of the bollworm in much the same way as it does with the leaf-worm.

ITS WORK AS AN ENEMY OF THE COTTON BOLL WEEVIL.

Considering the important place that these ants hold among the natural foes of the two cotton pests of most serious importance before the advent of the Mexican cotton boll weevil, it is not at all surprising to find it filling a high place as an enemy of the weevil. For several years it has been known that ants frequently attack the immature stages of the weevil in both squares and bolls, but observations made during the season of 1905 have shown that this native ant may be—at least under favorable conditions—a more important factor in the destruction of the weevil than has hitherto been supposed.

During the experiment which was being made to test the effect of direct sunshine in destroying immature stages of the weevil, 150 squares were selected, each of which was believed to contain some stage of the insect. These squares were divided into two lots of 75 squares each and placed upon the bare ground in an exposed spot in the cotton plat at the laboratory in Dallas, Tex. One lot was left dry, while the other was thoroly wetted to determine whether the mortality would be as great in exposed squares which were kept moist. The squares were placed on the ground at 4.30 p. m., September 5. The following morning, while again wetting the lot which was to be kept moist, numerous ants were noticed running around and over the squares, tho no sign of a nest had been seen near that spot on the previous evening. A hasty examination showed, in several squares, holes (fig. 7, *b*, *c*) which in size and external appearance resembled weevil emergence holes (fig. 7, *a*) so closely that at first they were mistaken for them, and it was feared that the stages of the weevil in the squares were too nearly mature to serve as suitable material for the experiment intended. A more careful examination, however, showed that the weevils were not emerging, but that the holes in the squares were really entrance holes made by the ants to enable them to get at the immature weevils within. As it was evident that nearly all of the squares had been opened, the experiment intended was abandoned and a complete examination made of all the squares.

It was soon found that the ant-made holes could, from internal conditions if not from external appearances, be distinguished positively from those made by the weevil, and it was also possible to tell with considerable certainty whether the victim was in the larval or the pupal stage, tho in only a few cases had the ants left any remains of their prey. A careful examination of the interior of a square from which a weevil has emerged shows invariably a small quantity of fine débris removed by the weevil from the wall of the square in cutting its way out. Besides this, there is a small amount of white excrementitious material, the final product of the transformation, which is voided by the weevil before it leaves its cell.

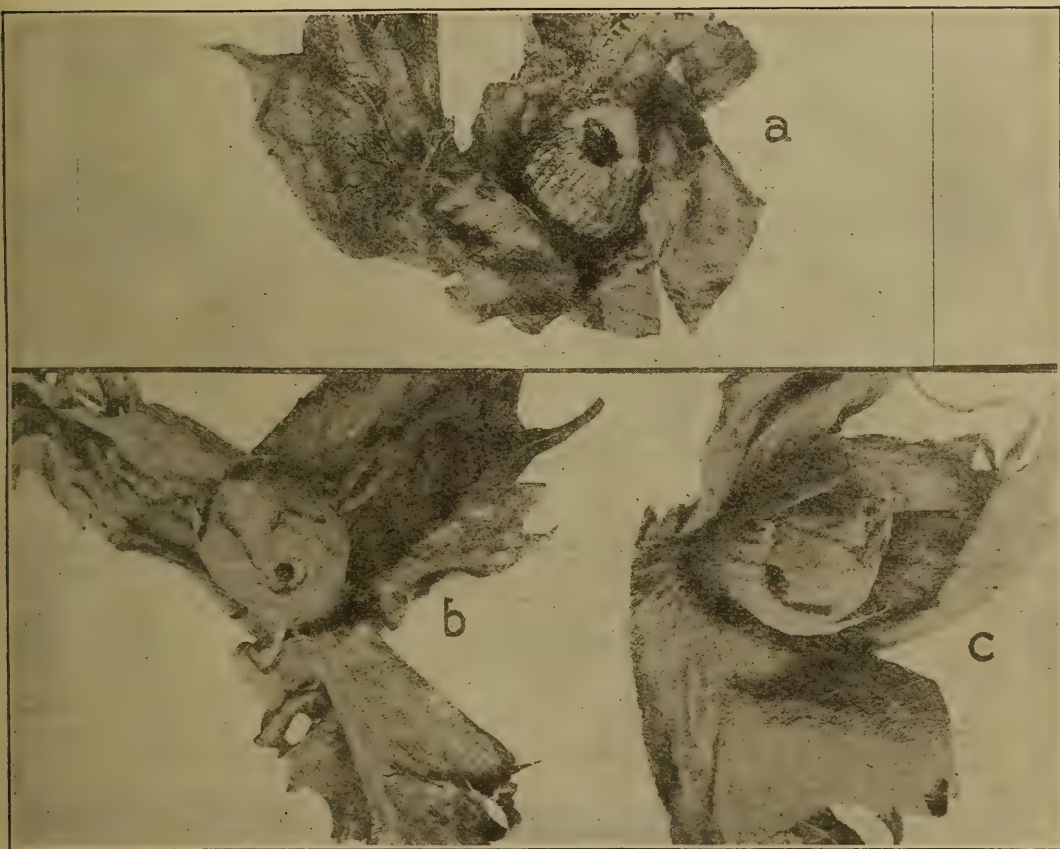


FIG. 7.—An ant enemy of the cotton boll weevil: *a*, cotton square showing emergence hole of boll weevil; *b*, *c*, cotton squares showing entrance holes of *Solenopsis geminata* var. *xyloni*. Slightly enlarged (original).

In cases where the squares had been entered by ants and an immature stage destroyed, neither of these signs of adult weevil activity could be found, but the stage of the weevil could in most cases be told from the presence or absence of the larval exuviae, which are generally untouched by the ants.

In the lot of 75 squares kept dry it was found that the ants had entered 64, destroying 44 stages which were probably larvæ and 20 which were probably pupæ. Eleven squares showed no ant holes. Of these, 7 contained no weevil stage, 3 contained live, unharmed larvæ of a parasite of the weevil (*Bracon mellitor* Say) and the

remains of the weevil larvæ destroyed by them, and 1 a dead, moldy weevil larva.

In the lot of 75 squares kept wet the ants had entered 73, destroying 50 stages which probably were larvæ and 23 probably pupæ. The 2 squares not entered by the ants had contained no stages of the weevil. No signs of parasite destruction could be found in this lot of wet squares.

A brief summary of the examination of these 150 squares shows that 9 of them did not contain any stage of the weevil. Not one of the uninfested squares nor, apparently, any one of those containing a parasitized or dead larva was opened by the ants. Among the 137 squares opened by the ants not a single weevil stage escaped destruction, tho the squares had been on the ground but eighteen hours.

The unquestionable connection of these ants with the rapid and complete destruction of every living weevil stage in 150 squares shows their possible efficacy in the field under conditions which favor their work. The ants were not exceptionally abundant where the foregoing demonstration occurred. The nearest nest was under a cotton plant about 3 feet from the bare spot where the squares were exposed.

On September 25 an examination was made of 300 fallen squares and small bolls collected at random from the ground in this plat. It was found that at that time the ants had destroyed 40 per cent of all weevil stages infesting those squares and bolls. October 6, in an examination of 212 fallen squares and small bolls, it was found that the ants had destroyed 35 per cent of the weevil stages. Observations made after November 1 indicated that the ants had then practically ceased their activity, only about 10 per cent of the weevil stages having been destroyed. The ants appear to be unable to enter the square or small boll until after decay has softened and weakened the resistance of the walls inclosing the weevil.

DISTRIBUTION.

These ants nest in the cotton fields and appear to be distributed over most if not all of the cotton belt. Their activity is far greater during hot dry weather than during cold wet weather; and this fact may account in some measure for the effect which wet weather is said to have in greatly increasing the numbers and destructiveness of the insect pests of cotton.^a

During the past season *Solenopsis geminata* var. *arizoni* has been taken from infested cotton fields in many localities in Texas and western Louisiana. It seems to be perfectly at home in various types of soil, and is undoubtedly of considerable benefit as an established enemy of the weevil in practically all of the area now infested.

^aBul. 51, Bur. Ent., U. S. Dept. Agric., pp. 137-138.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY—BULLETIN No. 63, Part IV.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

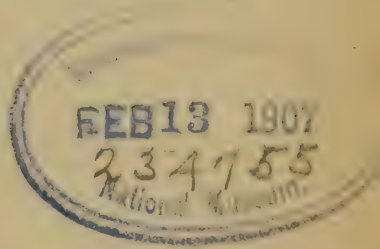
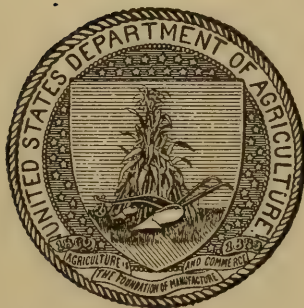
A PREDATORY BUG REPORTED AS
AN ENEMY OF THE COTTON BOLL WEEVIL.

BY

A. C. MORGAN,

Special Field Agent.

ISSUED FEBRUARY 8, 1907.



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., November 28, 1906.

SIR: I have the honor to transmit herewith a brief manuscript, by Mr. A. C. Morgan of this Bureau, concerning a predatory bug which was reported as an enemy of the boll weevil, but which, upon investigation, proves to be a species of economic insignificance. In order that the facts learned concerning this insect may be put on record for future reference, I recommend the publication of the paper as Part IV of Bulletin No. 63.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

A PREDATORY BUG REPORTED AS AN ENEMY OF THE COTTON BOLL WEEVIL.

(*Apiomerus spissipes* Say.)^a

By A. C. MORGAN,
Special Field Agent.

INTRODUCTION.

On May 3, 1905, the writer was sent to Gurley, Tex., to investigate the finding, by Mr. Sam. Allen, of that place, of a bug which he reported as an enemy to the Mexican cotton boll weevil (*Anthonomus grandis* Boh.). Mr. Allen had collected only one specimen, a nymph of *Apiomerus spissipes* Say. It was taken to Dallas, Tex., where it soon molted and became adult. Other adults were afterwards placed under observation at Dallas in order that the life history and habits of the species might be studied to determine to what extent it was an enemy of the boll weevil, and whether or not it is likely to become of economic importance.

Credit is due Mr. W. W. Yothers for valuable notes upon the life history of this species, especially as regards its food habits.

LIFE HISTORY.

Copulation.—May 23, 1905, a pair was observed in copulation in the field for over 6 hours at Gurley. Later, at Dallas, a pair was in copulation for 4 hours, and another pair for 3 hours. During the process the female assumes the normal position while the male clings to one side of her, holding on with the fore and hind legs.

Oviposition.—The eggs are laid in masses (fig. 8, *b*) of 40 to 60, tho as few as 10 were recorded in one instance and 23 in another. Individual records are as follows: 37, 41, 49, 54, and 64. The usual place for oviposition is the underside of a leaf, near the top of the plant. Egg masses have been collected in this position from *Ambrosia* sp. and *Helianthus* sp. The eggs are placed so close to each other, side by side, that in the center of the mass, instead of being cylindrical, they are usually more or less hexagonal.

The egg.—The egg (fig. 9) is cylindrical, finely punctured, and varies in color from a bright yellow when first deposited to a light brown

^aOrder Hemiptera, family Reduviidæ.

just before hatching. The collar is shining white. The dimensions of the egg are as follows: Width at narrowest part—just



FIG. 8.—*Apiomerus spissipes*: a, nymph, 5th instar; b, egg mass; c, adult, side view; d, same from above. a, c, d, natural size; b, enlarged (original).

below collar—0.5 mm.; greatest width, 0.64 mm.; length below collar, 1.51 mm.; length of collar, 0.26 mm.; total length, 1.77 mm. The width of the collar varies from slightly less than the greatest width of the egg to slightly more.

Incubation.—Incubation varies slightly in the time required in different egg masses. Thus, in May, under conditions exactly the same, incubation required 12 days in one instance and 16 in another. During mid-

summer 10 to 12 days were sufficient. Later, in the fall, 14 to 16 days were required.

FOOD.

The insects preyed upon in the laboratory embraced the orders Orthoptera, Hemiptera, Lepidoptera, Diptera, and Hymenoptera. The process of feeding is a long one and varies with the size of the prey. In general the reduviids lie in wait in an alert attitude for the approach of an insect and then spring upon it, but frequently they take the initiative and fly or run toward an insect. The insect fed upon is not left until all the juices are sucked from its body. Sometimes this takes only a half hour, at other times the reduviid feeds for one or two hours. Boll weevils fed upon by *Apiomerus spissipes* are often as dry and crush almost as easily between the fingers as do pinned specimens. The first puncture by the beak of *spissipes* is generally fatal. In the case of boll weevils, upon which *spissipes* frequently fed, the weevil made only a few spasmodic movements after

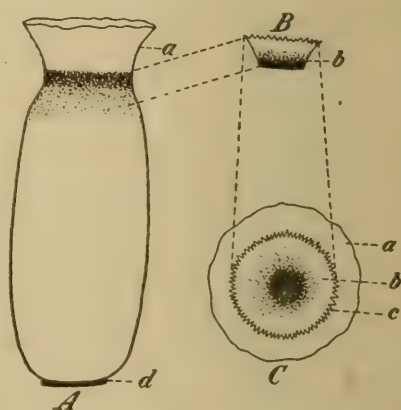


FIG. 9.—Egg of *Apiomerus spissipes*: A, side view of egg; B, egg-cap, side view; C, top view of egg; a, collar; b, egg cap; c, point of junction of egg cap with egg; d, attachment of egg to leaf. Much enlarged (original).

the first insertion of its captor's beak, and then ceased to move. The power of the bite of this insect was well illustrated upon the writer while collecting specimens. One adult inserted l's bill in the end of the thumb. The pain at first was not so great as that from the sting of a bee or wasp, but in a few moments it was much greater than the writer had ever experienced from any hymenopteron's sting. It continued unabated for over an hour, and the spot was tender to the touch for two weeks.

Altho locusts, bees, wasps, and an occasional moth were eaten, Coleoptera and Diptera were preferred. The following tables give the food for a number of days of a nymph of *Apiomerus spissipes*, and, for comparison, the food of another reduviid (*Sinea diadema* Fab.):

Food of nymph of *Apiomerus spissipes* in third instar.

Date.	Pepper weevils (<i>Anthonomus æneotinctus</i>).				Boll weevils (<i>Anthonomus grandis</i>).			
	Number added.	Number killed.	Number alive from previous day.	Total number alive.	Number added.	Number killed.	Number alive from previous day.	Total number alive.
October 16.....	3			3	1	0		1
17.....	5	3	0	5	0	0	1	1
19.....	7	5	0	7	0	0	1	1
20.....	5	5	2	5	0	0	1	1
21.....	7	3	1	8	0	0	1	1
23.....	20	7	1	21	0	0	1	1
24.....	0	11	9	10	0	0	1	1
25.....	0	4	5	5	0	0	1	1
26.....	0	2	3	3	0	0	1	1
28.....	5	3	0	5	5	0	1	6
30.....	0	0	5	5	0	2	4	4
November 2.....	0	2	3	3	0	1	3	3
4.....	0	1	2	2	0	0	3	3
6.....	5	2	0	5	0	0	3	3
8.....	0	2	3	3	0	0	3	3
Total.....		50				3		

The nymph did not feed after November 8. On December 1 it was placed in a cool room for hibernation, but must have died shortly afterwards, for on January 25, 1906, it was found dead and shrunken.

Food of an adult *Sinea diadema*.^a

Date.	Pepper weevils (<i>Anthonomus æneotinctus</i>).				Boll weevils (<i>Anthonomus grandis</i>).			
	Number added.	Number killed.	Number alive from previous day.	Total number alive.	Number added.	Number killed.	Number alive from previous day.	Total number alive.
October 16.....	3			3				
17.....	5	3	0	5				
19.....	7	5	0	7				
20.....	5	5	2	7				
21.....	5	2	0	5				
23.....	14	4	1	15				
24.....	9	11	4	13				
25.....	11	12	1	12				
26.....	0	8	4	5	1			1
28.....	5	3	1	6	5	1	0	5
30.....	1	1	5	6	4	4	1	5
November 2.....	2	3	3	5	3	4	1	4
4.....	0	2	3	2	0	1	3	3
6.....	0	2	3	3	0	2	1	1
Total.....		61				12		

^aThe specimen died November 10.

It should be noted in these tables that while the nymph of *Apiomerus spissipes* killed 50 pepper weevils, and *Sinea diadema* 61 during the same period, yet *spissipes* killed only 3 boll weevils, while *Sinea* killed 12. These results indicate that little benefit can be expected from *spissipes* in the early stages. The boll weevil is too large for the nymphs to capture easily, hence the choice of the smaller, pepper weevils. It would appear also that a boll weevil diet is not a perfect one, for in the experiments with boll weevils as food for adult *spissipes* all died in a short time. One adult ate 27 weevils in thirteen days, but died on the fourteenth day. Other experiments gave similar results. The table shows also that *Sinea* does not prefer a diet of boll weevils. It ate only 20 per cent as many boll weevils as pepper weevils, altho active enough and strong enough to capture and kill them easily.

An adult *Apiomerus spissipes*, under observation from June 1 to July 3, ate 2 flies, 22 ladybirds, 1 bee, and 1 specimen of the twelve-spotted cucumber beetle (*Diabrotica 12-punctata* Oliv.), but died on July 6. Another adult, under observation from June 10 to 21, when it died, ate *D. 12-punctata* and a few ladybirds, but refused the potato beetle (*Leptinotarsa decemlineata* Say) and its larvæ and the sharpshooter (*Homalodisca triquetra* Fab.).

Other adults thrived for a time on house flies, but, like those fed upon weevils, they could not be kept alive. Neither did any combination of the above foods produce any better results.

Food of the young.—The impossibility of keeping the young alive thru more than two or three instars leads to the conclusion that proper food was not supplied them. On June 10 several specimens of *Apiomerus spissipes* hatched and were placed in a cage and supplied with cotton aphides (*Aphis gossypii* Glov.) in abundance. Altho fresh food was supplied daily, *spissipes* fed very rarely, and on July 3 the experiment was terminated by the death of the last of the nymphs. Other experiments with the cotton aphid resulted as in the preceding. October 3 a nymph nearing the third instar was fed upon nymphs of *Pentatoma ligata*. It ate 3 nymphs on the 3d and 4th, but died on the 5th. A combination of *ligata* nymphs and cotton aphides failed to keep another *spissipes* alive more than a few days. On September 6, 3 specimens of *spissipes* which had just hatched were isolated in a jar containing the egg mass from which they came. On September 8 all were dead. This experiment was made to determine whether the egg mass furnishes food for the first instar, as is the case with some pentatomids. From this experiment, and a subsequent one which gave the same results, it is evident that no food is obtained from the egg mass.

The best results were obtained by breaking open heads of *Ambrosia* in bloom and letting the *Apiomerus spissipes* nymphs select food from the insects frequenting this flower. Among the insects found in Ambro-

sia flowers *spissipes* fed upon *Triphleps insidiosus*, a species of the weevil genus *Apion*, many thrips, and larvæ and pupæ of a cecidomyiid gall-maker.

Cannibalism.—Cannibalism occurs in this species, but is not commonly indulged in. On October 3 three specimens of *Apiomerus spissipes* that had not fed since hatching were put in each of four pill boxes, without food. The first death occurred October 7, the last October 9. No instances of cannibalism occurred. Other experiments with newly hatched unfed nymphs gave the same result—no cannibalism. October 1 twenty-two specimens hatched and were fed upon insects found in heads of *Helianthus*. October 7 two nymphs were observed eating a third, and again on October 9, 10, and 12 the same observation was recorded. Other instances must have occurred in the intervals between observations, which would account for the death of individuals not apparently weak or diseased. It is evident, therefore, that the species is cannibalistic, but it is apparent that the first food must be obtained more easily than it could be by a contest with one of its kind of equal age and strength. In nature, however, where each individual goes upon a separate quest for food, it is very unlikely that cannibalism is a serious menace to the species.

LENGTH OF LIFE CYCLE.

Owing to the abnormal conditions in the laboratory, which made it very difficult to keep either young or old *spissipes* alive, the length of the instars could not be gaged with certainty. The time between copulation and oviposition varied from 4 to 7 days. Incubation required 10 to 16 days, according to season. The third molt in one instance occurred 12 days after the second, yet specimens have lived more than a month after the second molt without molting. The absences of the writer from the laboratory for a period of weeks at times destroyed the continuity of the experiment, and made it impossible to follow the life history as closely as was desired. However, there can not be more than a fragment of the second generation in a single season. Proper and improper food supply was undoubtedly the cause of the great variation in the length of instars noted above. In nature the same conditions of food supply undoubtedly exist, thus making a difference of months in the maturity of individuals hatched from the same egg mass. Observations in the field bear out this conclusion.

At no time during the year of 1905 could the young be found in any numbers. Altho adults were frequently observed in copulation in June and July at Gurley, later observations failed to disclose more than a few young. It is reasonable to suppose that among the survivors that finally reached maturity some encounter almost perfect con-

ditions as regards food, while others are barely able to exist, thus lengthening the instars and delaying maturity and greatly increasing the length of the life cycle.

NATURAL ENEMIES.

Only one natural enemy was recorded during our observations upon this species. This was a proctotrypid egg parasite, which Doctor Ashmead pronounced a new species of the genus *Hadronotus* Först. Only one egg mass was collected from the field. Of these eggs 12 per cent were parasitized.

DISTRIBUTION.

Say, in describing this species, reports it as being very abundant in Arkansas. Stål, in his *Enumeratio Hemipterorum*, reports it from Mexico and Texas. In the Proceedings of the Iowa Academy of Sciences Osborn reports it from Albuquerque, N. Mex. In 1905 it was collected in Texas at San Antonio and Cotulla by J. C. Crawford, at Handley by J. C. Crawford and W. D. Pierce, at Rosser by C. R. Jones and F. C. Bishopp, and at Gurley and Dallas by the writer. Pittier reports it also from Cruz de Guanacaste, Costa Rica, in *Invertebrados de Costa Rica*.

CONCLUSION.

Altho the experiments upon *Apiomerus spissipes* were conducted in the laboratory under conditions more or less unfavorable to the species, yet enough has been learned of its food habits to class it as a species of doubtful economic value, if not one of positive injury. Also, its scarcity in cotton fields, even tho abundant upon the borders, argues unfavorably. Only occasionally have specimens been observed upon cotton plants, and in the instances when these were observed feeding it was always upon ladybirds. Again, in midsummer, when weevils were most numerous, *spissipes* could not be found either in the cotton fields or near their borders.

The only injurious insects fed upon were the boll weevil (*Anthonomus grandis*), the pepper weevil (*A. æneotinctus*), the twelve-spotted cucumber beetle (*Diabrotica 12-punctata*), and a few house flies. This was in laboratory experiments. It is doubtful if any of these are fed upon more than occasionally in the field, for not a single instance has been recorded.

Lastly, the great mortality of the young and consequent paucity of adults, the unspecialized food habits, the failure to feed to any appreciable extent upon harmful insects, and the practical disappearance of the species from the vicinity of cultivated fields during a part of the summer would unquestionably place *Apiomerus spissipes* among insects of economic insignificance.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY—BULLETIN NO. 63, Part V.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

NOTES ON THE PEPPER WEEVIL.

BY

F. C. PRATT,

Assistant.

ISSUED FEBRUARY 9, 1907.



WASHINGTON:

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., November 30, 1906.

SIR: I have the honor to transmit herewith for publication as Part V of Bulletin No. 63, a brief paper, by Mr. F. C. Pratt of this Bureau, on the pepper weevil, an insect which has proven very destructive to different varieties of peppers in certain localities in Texas and which, owing to a similarity in appearance to the boll weevil, has in some cases been confused with that insect.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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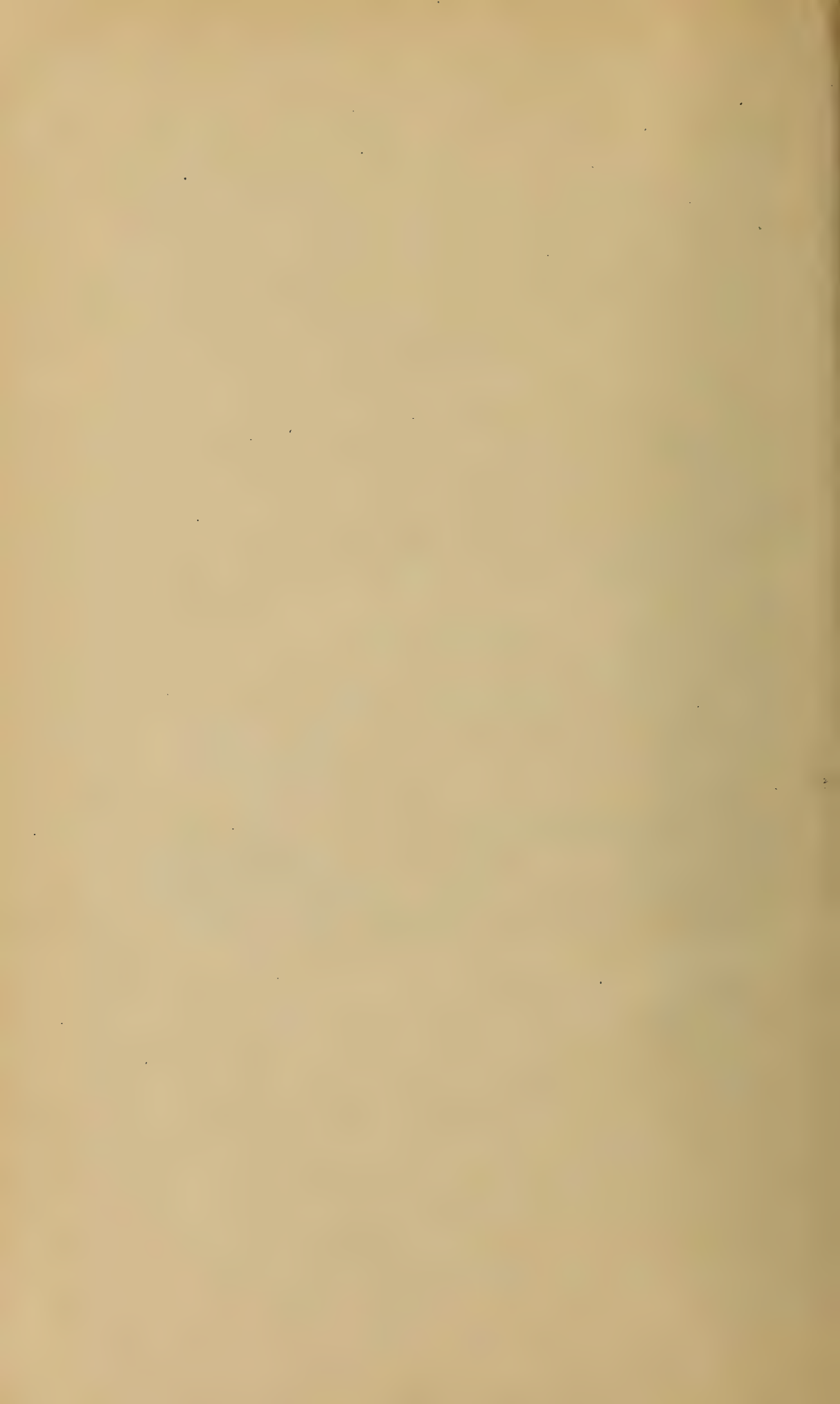
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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

NOTES ON THE PEPPER WEEVIL.

(*Anthonomus xneotinctus* Champ.)

By F. C. PRATT, *Assistant*.

OCCURRENCE IN TEXAS.

In a previous bulletin^a Mr. C. M. Walker gives an account of the pepper weevil, which had been injuring peppers in Texas. Investigation during the fall of 1905 resulted in proving the disappearance of this insect at Boerne, Tex., where it was first reported. Diligent search in October and November by the writer, who was assisted by Mr. L. Lamm, failed to show the existence of the weevils at that place, altho peppers had been grown as extensively as before.

At San Antonio, Tex., many truckers had given up the growing of peppers on account of their experience the year previous, and on one patch at Collins Gardens fully 80 per cent of the pods were attacked, and several bushels of chilli and sweet peppers were shipped from there to Dallas for observation.

Several places, Floresville, Seguin, and New Braunfels, in the vicinity of San Antonio, were visited to ascertain the extent of the infested territory, but without success. Corpus Christi also was visited, but no injury was noticed and no reports were obtained concerning the weevils.

Mr. J. C. Crawford reported the presence of the weevil about 8 miles south of San Antonio, the grower having claimed to have noticed this insect for several years. At Cotulla, Tex., Mr. Henry Caley reported slight injury at one of his truck farms near that place, altho the insect was not seen by the writer.

ORIGIN.

That this insect (adult, fig. 10) has been introduced into the United States from Mexico in recent years, there is no doubt, the exact date at this time being undeterminable. Inquiries at San Antonio commission houses elicited the information that peppers were shipped from Laredo, Artesia, and Cotulla. As a matter of fact, few peppers are raised at these places, the principal crop being onions. Mr. Caley, at Cotulla, denied ever shipping peppers and was very skeptical about

^a Bul. 54, Bur. Ent., U. S. Dept. Agric., pp. 43-48, 1905.

any having been shipped from there at any time. Further information showed that peppers were bought up in carload lots in Mexico and shipped to the United States and without much doubt rebilled from the localities mentioned to give an impression that these peppers were home grown. Dr. A. W. Morrill reported that a large number of peppers were shipped annually to the United States from the districts of Zacatecas and San Luis Potosi, Mexico, and he had collected the weevil at Tlahualilo, Durango, Mexico.



FIG. 10.—Pepper weevil (*Anthrenus xanthotinctus*): Adult. Much enlarged (after Hunter and Hinds).

FOOD PLANTS.

It is evident that the weevil does not breed in the wild or bird pepper, for these plants were examined thoroly at all the points visited as well as at Victoria, Tex. The bell or sweet pepper (Pl. II, figs. 4-6), chilli (Pl. II, figs. 1-3), and tabasco peppers of several varieties are always affected wherever the weevil occurs.

NATURAL ENEMIES.

As in the case of the boll weevil (*Anthonomus grandis* Boh.), altho a few parasites were reared, these did not occur in sufficient numbers to keep the insect in check. Mr. J. C. Crawford has identified the parasitic species as *Bracon mellitor* Say, and *Cutolaccus incertus* Ashm. A small ant, *Solenopsis geminata* Fab.,^a was noticed to be actively engaged in removing larvæ and pupæ from the pods which had weevil exit holes in them, but in no case did the ants make an entrance themselves.

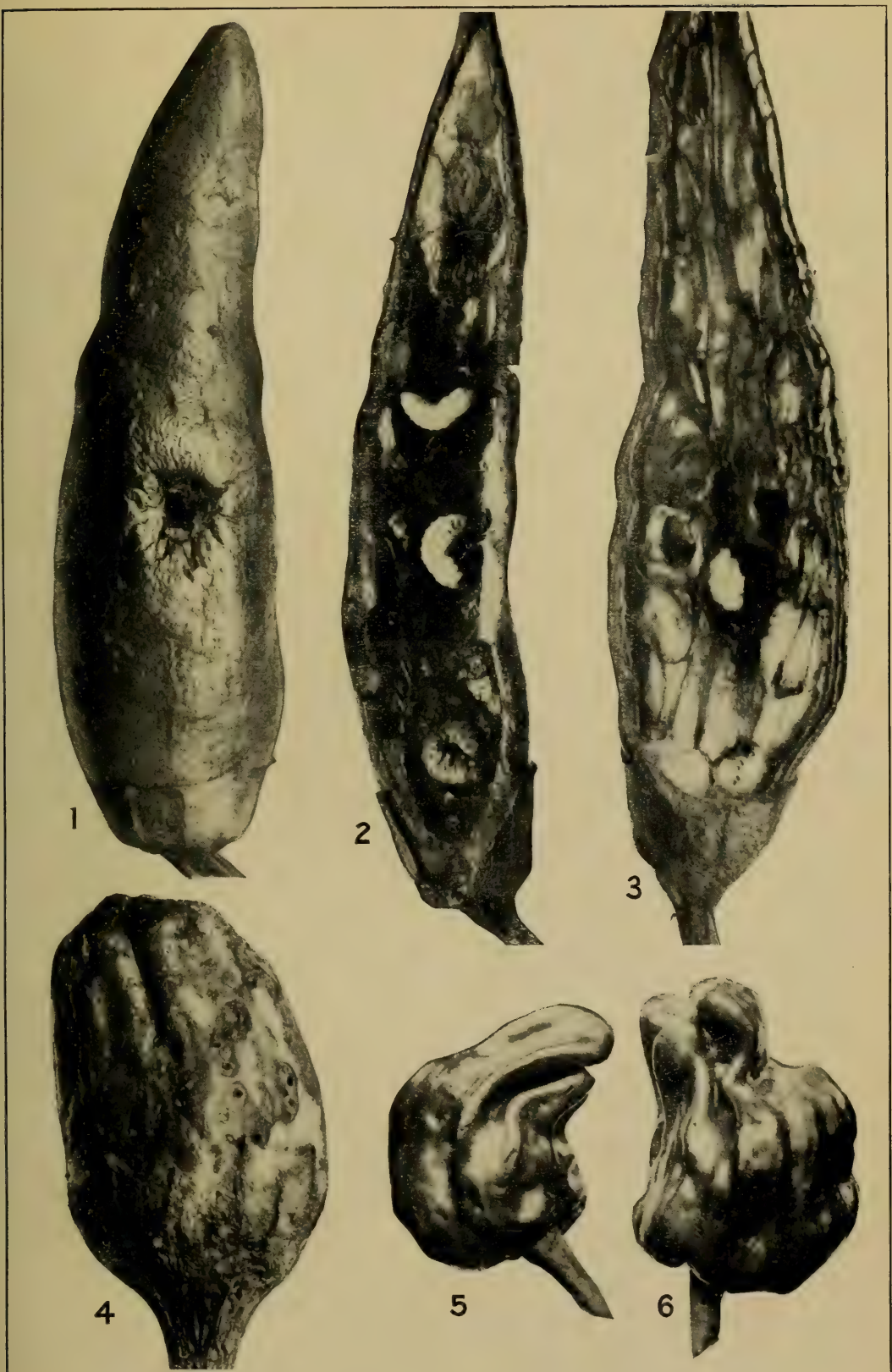
In the parasite breeding cages thousands of small mites were observed by Mr. W. W. Yothers, who reported that their presence in no way incommoded the weevils.

To determine the average number of weevils that may infest the chilli peppers, several experiments were tried, with the following results:

Experiment No.	Number of pods.	Number of weevils emerged.	Period covered.
1.....	80	86	Oct. 18-Nov. 4.
2.....	230	156	Do.
3.....	200	143	Oct. 18-Nov. 11.
4.....	100	123	Oct. 18-Oct. 31.
Total ..	610	508	

Thus it will be noticed that an average of nearly one adult to each pod was bred.

^aSee Bul. 63, Pt. III, Bur. Ent., U. S. Dept. Agric. An Ant Enemy of the Cotton Boll Weevil. By W. E. Hinds.



WORK OF THE PEPPER WEEVIL (*ANTHONOMUS ÆNEOTINCTUS* CHAMP).

Fig. 1.—Emergence holes of adult in chilli pepper. Fig. 2.—Full-grown larva *in situ* in chilli pepper. Fig. 3.—Pupæ in cells in chilli pepper. Fig. 4.—Undeveloped bell pepper pod, showing numerous egg and feeding punctures. Figs. 5, 6.—Malformed bell pepper pods, caused by egg punctures. Figs. 1-3 three times natural size; fig. 4 twice natural size; figs. 5, 6 one-half natural size. (Original.)

The maximum numbers of individuals found in two pods were as follows:

Pod.	Adults.	Pupæ.	Larvæ.	Total.
1...	2	5	2	9
2.....		5	6	11

Many pods showed six egg punctures, from which five larvæ, in one instance, developed. It was also noticed that in nearly every case where egg insertion was made beyond the middle of the pod the larva was to be found slightly back of the puncture, but where the egg was deposited between the stem and middle of the pod the larva was located immediately underneath. The average number of egg punctures to a pod proved to be about two and one-third.

PROLIFERATION.^a

Proliferation was noticed in pods purchased in market at San Antonio, Tex., October 6, 1905, and the following two series of experiments were conducted by Dr. W. E. Hinds and Mr. W. W. Yothers:

Experiments to determine the effects on the pepper weevil of proliferation in the pepper pods.

FIRST SERIES.

Date.	Number of pods examined.		Pods with proliferation.										Pods without proliferation.						Feeding punctures.					
			Stages alive.					Stages dead.					Stages alive.			Stages dead.								
			Number.	Per cent of total.	Eggs.	Larvæ.	Pupæ.	Adults present.		Adults escaped.	Larvæ.	Pupæ.	Adults.	Per cent of stages.	Number.	Per cent of total.	Larvæ.	Pupæ.	Adults.	Larvæ.	Pupæ.	Per cent dead.	With proliferation ^b	Without proliferation.
Oct. 17..	100	41	41.0	0	18	25	8	6	1+	1 par.	0	3.4	59	59.0	20	22	24	7	2	12	26	47		
Oct. 31..	19	4	21.1	0	3	0	1	0	0	0	0	0.0	15	78.9	7	0	0	0	0	0.0	12	27		
	119	45	37.8	0	21	25	9	6	2	0	0	3.2	74	62.2	27	22	24	7	2	11.0	38	74		

SECOND SERIES.

Oct. 14..	12	11	91.7	0	13	10	9	6	1	0	1	5.0	1	8.3	0	0	0	0	0	0	0	3	45
Do...	120	111	92.5	0	125	102	19	34	1	1	0	0.7	9	7.5	2	0	0	0	0	0	0	(c)	(c)
Oct. 31..	21	21	100.0	1	55	34	10	1	1	0	0	0.0	0	0	0	0	0	0	0	0	0	155	9
	153	143	93.5	1	193	146	38	41	3	1	1	1.2	10	6.5	2	0	0	0	0	0	0	.....	.....

^aSee also Bul. 59, Bur. Ent., U. S. Dept. Agric., p. 38, 1906.
^bThis is a record of the proliferated areas on inside of pods and is a minimum.—W. E. H.
^cNot recorded.

REMEDIES.

In addition to the usual gathering and destroying of fallen pepper pods, cultural experiments were conducted in the following manner: Some pods were buried in boxes under 1, 2, and 3 inches of soil respectively, keeping one series dry and the other moist—conditions which would result necessarily from irrigation. In the former series the pods dried up and in the latter the pods rotted.

Experiments to determine the effect upon the pepper weevil of covering fallen infested pods with soil.

Number of pods.	Number of punctures.	Depth of soil.	Condition of soil.	Period covered.	Number of weevils emerging Oct. 19–Nov. 4.	Number of weevils found dead in soil Nov. 17.
25	62	<i>Inches.</i> 1	Wet	Oct. 19–Nov. 14 ...	1 adult; 1 parasite.	6 adults.
25	61	1	Dry	do	9 adults.....	12 adults.
25	56	2	Wet	do	4 adults.....	1 adult.
25	60	2	Dry	do	3 adults.....	5 adults.
50	115	3	do	do	15 adults.....	14 adults.

^a Three of these weevils died as soon as they came thru the soil.

Thus it will be readily seen that the covering of the fallen pods every two to three weeks with from 1 to 3 inches of soil would be advantageous. This could be arranged by bedding high and then lowering the soil. Where irrigation is practised the decay of the pods is greatly hastened, thus depriving the larvæ of this food supply. It is only fair to state that at the time the pods in these experiments were buried most of the larvæ were nearly full fed, consequently a larger number came to maturity than would have been the case had burial occurred while the larvæ were small. Two other experiments were conducted by Mr. W. W. Yothers in large cages in the open, with the following results:

Experiments to determine the effect upon the pepper weevil of covering fallen infested pods with soil.

Number of pods.	Depth of soil.	Condition of soil.	Date of examination.	Number of weevils emerged.	Number of weevils dead in soil Nov. 15.
500	<i>Inches.</i> 3	Dry ^a	Oct. 20	64	None found.
450	2	Dry ^a	Oct. 23	50	Do.

^a Heavy rains October 24 and November 10.

October 31 about 200 of the last-mentioned lot of pods were examined and found to contain 73 living and 9 dead stages; of this number 47 were pupæ and 15 were larvæ. The latter necessarily would have starved, owing to the rapid decay of the buried pods.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—BULLETIN NO. 63, PART VI.

L. O. HOWARD, Entomologist and Chief of Bureau.

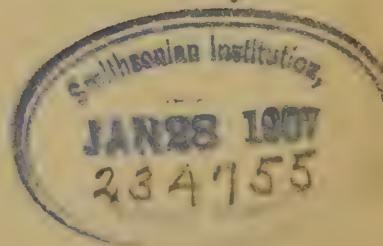
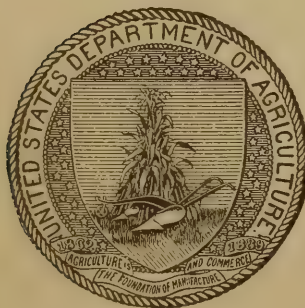
PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

THE STRAWBERRY WEEVIL
IN THE SOUTH-CENTRAL STATES IN 1905.

BY

A. W. MORRILL,
Special Field Agent.

ISSUED JANUARY 22, 1907.



WASHINGTON:
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1907.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., December 1, 1906.

SIR: I have the honor to transmit herewith a brief report on the status of the strawberry weevil in the south-central States in 1905, by Dr. A. W. Morrill, special field agent in this Bureau. As this strawberry pest is related to the boll weevil and is extensively parasitized there is a possibility that some one or more of its parasites may be induced to attack the boll weevil. Its greater or less abundance in or near the region infested by the boll weevil is therefore a matter of importance. I recommend the publication of the report as Bulletin No. 63, Part VI, of this Bureau.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

THE STRAWBERRY WEEVIL IN THE SOUTH-CENTRAL STATES IN 1905.

(*Anthonomus signatus* Say.)

By A. W. MORRILL,
Special Field Agent.

For some time the Bureau of Entomology has been experimenting along the line of inducing parasites of related native species of weevils to prey upon the cotton boll weevil (*Anthonomus grandis* Boh.). One of the commonest and most parasitized of such weevils is the strawberry weevil (*Anthonomus signatus* Say). It was consequently important to ascertain whether this insect occurred in or near the infested regions of Texas and Louisiana and to what extent it was controlled by parasites.

In connection with this work, during the month of April, 1905, advantage was taken of an opportunity to observe the occurrence and injury of the strawberry weevil in the leading strawberry-producing sections of Texas, Louisiana, and Arkansas. Examinations were made in all cases in the blooming season when the insects would, if present, occur in their greatest abundance. In consideration of the destructiveness of this species in the strawberry fields of Maryland and North Carolina during the past few years, the data concerning its occurrence and nonoccurrence in the important strawberry-growing sections of other States are deemed of sufficient importance to be recorded.

THE STRAWBERRY WEEVIL IN TEXAS.

According to the latest available statistics (1899),^a more than four-fifths of the strawberries produced in the State of Texas are grown in two limited areas comprizing three counties. Of these sections the

^a Twelfth Census of the United States, 1900.

one ranking first in importance includes Brazoria and Galveston counties—two adjoining coast counties near the southeastern corner of the State. In this section examinations were made on April 7 and 8 at Alvin and Galveston, respectively, but without finding any indications of the presence of the strawberry weevil. The second largest strawberry-growing section of Texas is included in Smith County, near the northeastern corner of the State. An examination was made at Tyler, near the center of this section, on April 13, and again on April 28. On the first of these dates a single adult specimen was taken, and on the second occasion two adult specimens. In a total of about three hours spent near Tyler in fields of strawberries, blackberries, and dewberries, searching for these weevils and for evidence of their work, only the three adults and less than fifty injured buds were found.

The only published record known to the writer of the strawberry weevil's occurrence in Texas was by Dr. F. H. Chittenden,^a who reported injury by this species, in 1897, to blackberries and dewberries near Denison, in Grayson County, in the north-central section of the State. The fruit farms of the two correspondents who reported serious losses in that year were visited by the writer on April 21, 1905, and examinations made in fields of strawberries, blackberries, and dewberries. One of the owners reported that the weevils had been scarcely noticeable since April, 1897, when they were very destructive and so abundant that on sunshiny days they seemed to fairly swarm on the foliage of the food plants. This encouraging report concerning its scarcity in recent years gives ground for the hope that conditions in northern Texas will as a rule be unfavorable for this pest, altho a certain degree of intermittence in abundance during a series of years has been generally observed in other localities.

THE STRAWBERRY WEEVIL IN LOUISIANA.

In 1899, as shown by the Census report,^b 90 per cent of the strawberries produced in this State were grown in Tangipahoa Parish. This parish is located a short distance northwest of New Orleans. Hammond, one of the two leading shipping points in the parish, was visited on April 11. Examinations in strawberry fields and of wild blackberry bushes along the roadsides, in a downpour of rain, resulted in finding no evidence of the presence of the strawberry weevil near this place. As the day was so far from an ideal one for finding adults of this species, the only significant point is the failure to find a single flower bud injured in a manner to cause their presence to be suspected.

^a Bul. 10, n. s., Div. Ent., U. S. Dept. Agric., pp 82-83.

^b Twelfth Census of the United States, 1900.

THE STRAWBERRY WEEVIL IN ARKANSAS.

The strawberry-growing industry in Arkansas is a very important one, in 1899 the production of this State being nearly four times that of Texas and Louisiana combined; or, in round numbers, nearly 13,000,000 quarts. Three sections of the State were visited, including the two leading strawberry-growing districts which together produce more than four-fifths of all the strawberries grown in the State.^a The first in importance of these sections comprizes three adjoining counties in the northwest corner of the State—Benton, Washington, and Crawford. Van Buren, located in Crawford County, the southernmost of the three named, was visited on April 27. A single adult specimen of the strawberry weevil was taken on a wild blackberry growing by the roadside, but in the strawberry fields the only indications of its presence which were found were a few scattering severed flower buds. The second section in importance in strawberry production in Arkansas is located in White County, which is situated a short distance northeast of the geographical center of the State. This county in 1899^a produced one and a half million quarts of strawberries, or a quantity a little short of equaling the total production of the State of Louisiana. Bald Knob and Judsonia, two leading strawberry shipping points in Smith County, were visited on April 25. Many strawberry fields were visited, and the weevil was found to be moderately abundant near these localities. The destruction in the many fields examined was estimated to range from 5 to 25 per cent of the flower buds, averaging between 10 and 15 per cent. Along the roadsides a small percentage of the flower buds of wild blackberries had been wholly or partially severed. The weevil and its destructive habits were found to be fairly well known among the strawberry growers in this section, by whom the weevil was reported to have varied in abundance from year to year, and in occasional years in the past to have accomplished considerable damage. The destruction of the flower buds, as mentioned above, did not necessarily represent a proportionate loss to the growers, as picking had begun about ten days earlier, and berries produced from flowers which set at a later date than the writer's examination very likely would remain unpicked owing to the expected falling off in the market demands. The third locality in Arkansas where an examination was made is near the center of the State, 1 mile from Little Rock. An hour's search in a strawberry field on April 26 revealed a few severed buds, while not a hundred yards away wild blackberries, which were very common along the roadsides, had from 5 to 10 per cent of their flower buds destroyed. The only adult specimen of the strawberry weevil taken in this vicinity was on a blackberry bush.

^aTwelfth Census of the United States, 1900.

VARIETIES OF STRAWBERRIES GROWN.

At Alvin, Tex., the favorite variety among the strawberry growers is the Klondike, while at the other localities mentioned individual preference seems to be divided between the Lady Thompson, Michel, and Excelsior varieties. In the section of the country to which these notes refer, the writer has never met any strawberry growers who use any but bisexual varieties. Arkansas growers, who probably suffer more or less loss every year from the strawberry weevil, should be encouraged to introduce suitable early pistillate varieties, as the insect in that State threatens to cause, occasionally at least, considerable destruction.

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—BULLETIN NO. 63, Part VII.

L. O. HOWARD, Entomologist and Chief of Bureau.

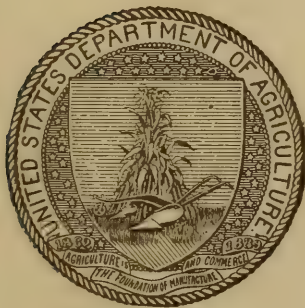
PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

THE COTTON STALK-BORER.

BY

A. C. MORGAN,
Special Field Agent.

ISSUED FEBRUARY 9, 1907.



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1907.

LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., December 1, 1906.

SIR: I have the honor to transmit herewith a short account of the cotton stalk-borer, prepared by Mr. A. C. Morgan, special field agent in this Bureau. Altho this insect appears, as a rule, to attack cotton stalks which are already injured or diseased, thus causing only slight damage to the crop, Mr. Morgan finds evidence that healthy stalks may be occasionally attacked. I recommend the publication of the paper as Part VII of Bulletin No. 63 of the Bureau of Entomology.

Respectfully,

L. O. HOWARD,
Entomologist and Chief of Bureau.

• Hon. JAMES WILSON,
Secretary of Agriculture.

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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

THE COTTON STALK-BORER.

(*Ataxia crypta* Say.)

By A. C. MORGAN,
Special Field Agent.

During October, 1905, while inspecting cotton fields in the vicinity of Yoakum, Tex., the writer's attention was attracted by the great number of dead stalks. Examination showed that these stalks contained larvæ, pupæ, and adults of the cotton stalk-borer (*Ataxia crypta* Say).

DISTRIBUTION.

The specimen which Say described in 1832 as *Lamia crypta* came from Louisiana. Haldeman's specimen, described as *A. sordida*, came from Alabama. Leng and Hamilton recorded the species from Pennsylvania, Alabama, Louisiana, Texas, and New Mexico. In *Biologia Centrali-Americana* its habitat is extended to Almolonga, Mexico. It has been reported to the Department from Tucson, Ariz.; New Orleans, La.; Savannah, Ga.; Grant, Fla.; and Round Mountain, San Diego, Beeville, Bexar, Edgar, Flatonia, and Dallas, Tex. During 1905 the writer found it in Texas at Yoakum, Sublime, Corpus Christi, Cotulla, Alice, and Victoria. During February and March of 1906, Mr. W. W. Yothers collected hibernating adults from cotton bolls at Athens, Brenham, Navasota, and Calvert, Tex., and on March 1, 1906, the writer also obtained specimens from bolls at Flatonia, same State.

HOST PLANTS.

The cotton stalk-borer attacks a number of plants. At Tucson, Ariz., it was reported on *Helianthus* and *Xanthium*. At Savannah, Ga.; New Orleans, La., and Round Mountain, Tex., larvæ have been found boring in the twigs and trunk of the fig. Mr. E. A. Schwarz informs the writer that it has been bred frequently from the stem of *Ambrosia*, and one report of the borer in this plant was received by

the Department from Edgar, Tex. On March 1, 1906, the writer found larvæ in the stems of Ambrosia and Helianthus at Flatonía, Tex. It has been reported breeding in cotton from Bexar and San Diego, Tex., and the writer found it in October, 1905, breeding in this plant at Yoakum, Sublime, and Victoria, and in November at Alice, Tex. The adult has been reported from peach and apricot, but there are no records to show that it injures either of these plants. Leng and Hamilton state that specimens were found boring in dry twigs of box elder (*Acer negundo*) and hackberry.

LIFE HISTORY.

Very little work has been done upon the life history of this species. The egg is laid upon the host plant and the larva upon hatching bores into the bark or wood of the plant, where it feeds until full grown, pupates, and finally, when adult, cuts its way out. The winter is very probably past in any of the three stages of larva, pupa, or adult, for it has been reported by Mr. E. A. Schwarz as emerging in May, 1897, from a stalk of cotton cut in December, 1896. In October, 1905, the writer found the insect in cotton stalks in all stages of development from the very small larva to the adult ready to emerge from the stalk.

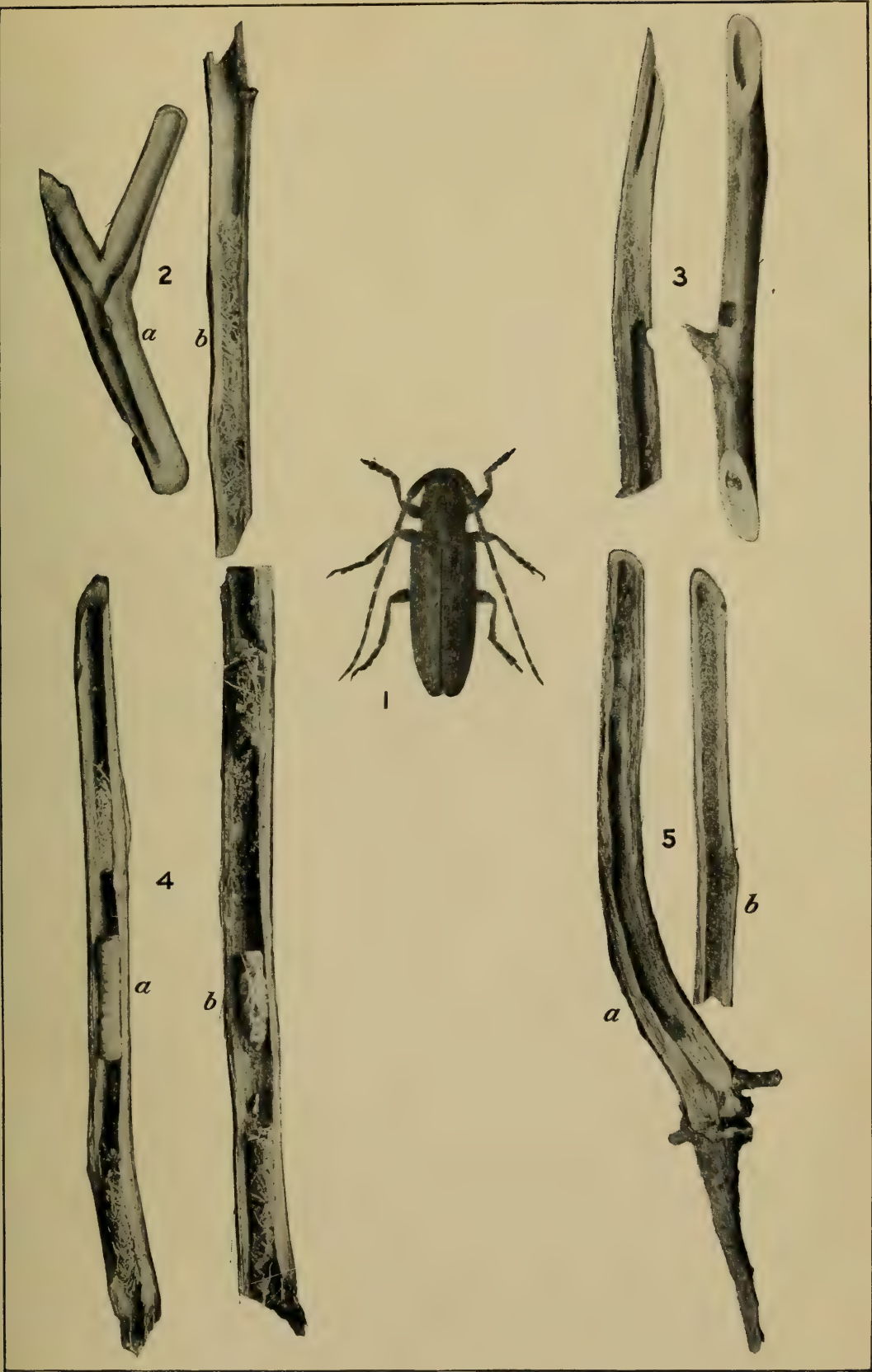
In southwest Texas, where the winters are very mild, it is very likely that development proceeds slowly all winter long, except in the most severe winters, when it would probably cease for a few weeks.

INJURY AND ECONOMIC IMPORTANCE.

Rarely has the cotton stalk-borer been reported, and in no case has serious damage been ascribed to it. Altho it was described by Say as early as 1832, no mention is made of it in economic literature until 1896, and since that time only five short notes have been made, all of which are apparently based upon Dr. L. O. Howard's first published notice in 1896, which reads as follows:

There is but one borer in the stalks of cotton, and that is the long-horned beetle known as *Ataxia crypta* (Say). It is occasionally mistaken for an enemy of the plant, but investigation has shown that it lays its eggs upon, and its larvæ bore into, only such stalks as have been damaged by some other cause, such as rust. It follows injury to the plant rather than causes it.

The rather general occurrence of this insect at Yoakum, Tex., in 1905 has made it seem advisable to publish this more extended note. Twenty-six fields were examined in this locality, and showed that from 5 to 10 per cent of the stalks were infested by this insect. One field had 20 to 25 per cent of its stalks injured by the borer. It is to be regretted that the discovery of this infested locality was not made earlier in the season, so that a more conclusive study could have been made.



THE COTTON STALK-BORER (*ATAXIA CRYPTA*).

Fig. 1.—Adult or beetle. Fig. 2.—*a*, Galleries; *b*, work. Fig. 3.—Emergence holes of adults. Fig. 4.—*a*, Larva *in situ*; *b*, pupa *in situ*. Fig. 5.—*a*, Gallery running into root of plant; *b*, castings behind larva. Fig. 1 twice natural size; figs. 2-5 two-thirds natural size. (Original.)

As has been stated by Doctor Howard, it is the larva of the borer that works in the cotton stalk. It confines its attack to the pith of the plant. The amount of injury depends upon the size of the plant and the number of borers. The writer found one plant about 3 feet high at Yoakum which contained eight larvæ, and which showed four emergence holes. The twelve borers had eaten out all the pith from the smallest branches to 3 inches below the surface of the ground in the tap-root. The small twigs were only thin shells and crumpled like paper between the fingers.

Nearly all infested plants showed unmistakable evidence of previous injury, yet the comparatively fresh and healthy condition of a few stalks points to the probability of an occasional attack upon perfectly healthy stalks. In the field showing an infestation of 20 to 25 per cent of its stalks it was estimated that the injured stalks had borne at least 80 per cent as much cotton to a stalk as had the uninjured ones. If it is true that the borer attacks only such stalks as are diseased or otherwise injured, then only a little damage can be attributed to it; yet the borer's attack, added to the injury due to disease, must hasten the death of the plant and thereby lessen the number of bolls to mature.

NATURAL ENEMIES.

From material collected at Yoakum, Tex., on October 28 two parasites of *Ataxia crypta* were bred. One, *Heterospilus websteri* Ashm., had entirely covered the pupa of *A. crypta* with its cocoons. In the majority of cases, however, this parasite had spun its cocoon after crawling away from the body of its host. Several masses of these cocoons were found with no trace of either the larva or pupa of *A. crypta* visible, and in one instance the larvæ of this parasite were found in a hollow cotton stalk and no form of *A. crypta* near. The second parasite belongs to the genus *Etroxys* and is a new species. There is some doubt that this species is a parasite upon *Ataxia*, but since it is parasitic upon beetles and its pupæ were found in a stalk bored out by *A. crypta*, it is here placed on record as a parasite of the latter.

REMEDY.

If at any time the injury by the insect should become serious the numbers of the borer can be easily reduced by destroying the infested stalks early in the fall. The time of destruction must, of course, vary in different localities, but it should be as early in October as possible for the latitude of Yoakum. By October 28 not more than 10 per cent of the borers had emerged. If the stalks had been destroyed early in October very few borers would have escaped. To obtain the best results, stalks should not be cut but plowed out, for many of the

borers go 2 or 3 inches below the surface of the ground in the tap-root and pupate there. In regions infested by the boll weevil, if the farmers would follow the directions given by this Bureau for the destruction of stalks, the cotton stalk-borer would not appear. In regions uninfested by the boll weevil but infested by the cotton stalk-borer, an occasional examination of infested areas for the emergence holes of the borer or an examination of the stages in the stalk—which can be made by splitting the stalk with a knife—will show the planter when to begin plowing and burning.

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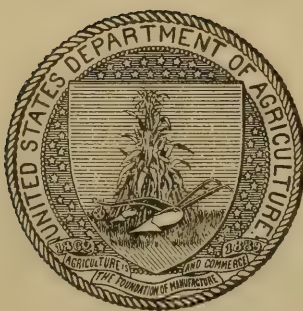
U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—BULLETIN No. 63.

L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

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L. O. HOWARD, Entomologist and Chief of Bureau.

PAPERS ON THE COTTON BOLL WEEVIL, AND
RELATED AND ASSOCIATED INSECTS.

I. HIBERNATION AND DEVELOPMENT OF THE COTTON BOLL WEEVIL.
By E. DWIGHT SANDERSON, *Formerly State Entomologist of Texas.*

II. NOTES ON THE BIOLOGY OF CERTAIN WEEVILS RELATED
TO THE COTTON BOLL WEEVIL.
By W. DWIGHT PIERCE, *Special Field Agent.*

III. AN ANT ENEMY OF THE COTTON BOLL WEEVIL.
By W. E. HINDS, *In Charge of Cotton Boll Weevil Laboratory.*

IV. A PREDATORY BUG REPORTED AS AN ENEMY OF THE
COTTON BOLL WEEVIL.
By A. C. MORGAN, *Special Field Agent.*

V. NOTES ON THE PEPPER WEEVIL.
By F. C. PRATT, *Assistant.*

VI. THE STRAWBERRY WEEVIL IN THE SOUTH-CENTRAL STATES IN 1905.
By A. W. MORRILL, *Special Field Agent.*

VII. THE COTTON STALK-BORER.
By A. C. MORGAN, *Special Field Agent.*



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1909.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., June 10, 1909.

SIR: I have the honor to transmit herewith, for publication as Bulletin No. 63, seven papers dealing with the cotton boll weevil and related and associated insects. These papers, which were issued separately during the early part of the year 1907, are as follows: Hibernation and Development of the Cotton Boll Weevil, by E. Dwight Sanderson; Notes on the Biology of Certain Weevils Related to the Cotton Boll Weevil, by W. Dwight Pierce; An Ant Enemy of the Cotton Boll Weevil, by W. E. Hinds; A Predatory Bug Reported as an Enemy of the Cotton Boll Weevil, by A. C. Morgan; Notes on the Pepper Weevil, by F. C. Pratt; The Strawberry Weevil in the South-Central States in 1905, by A. W. Morrill; The Cotton Stalk-Borer, by A. C. Morgan.

Respectfully,

L. O. HOWARD,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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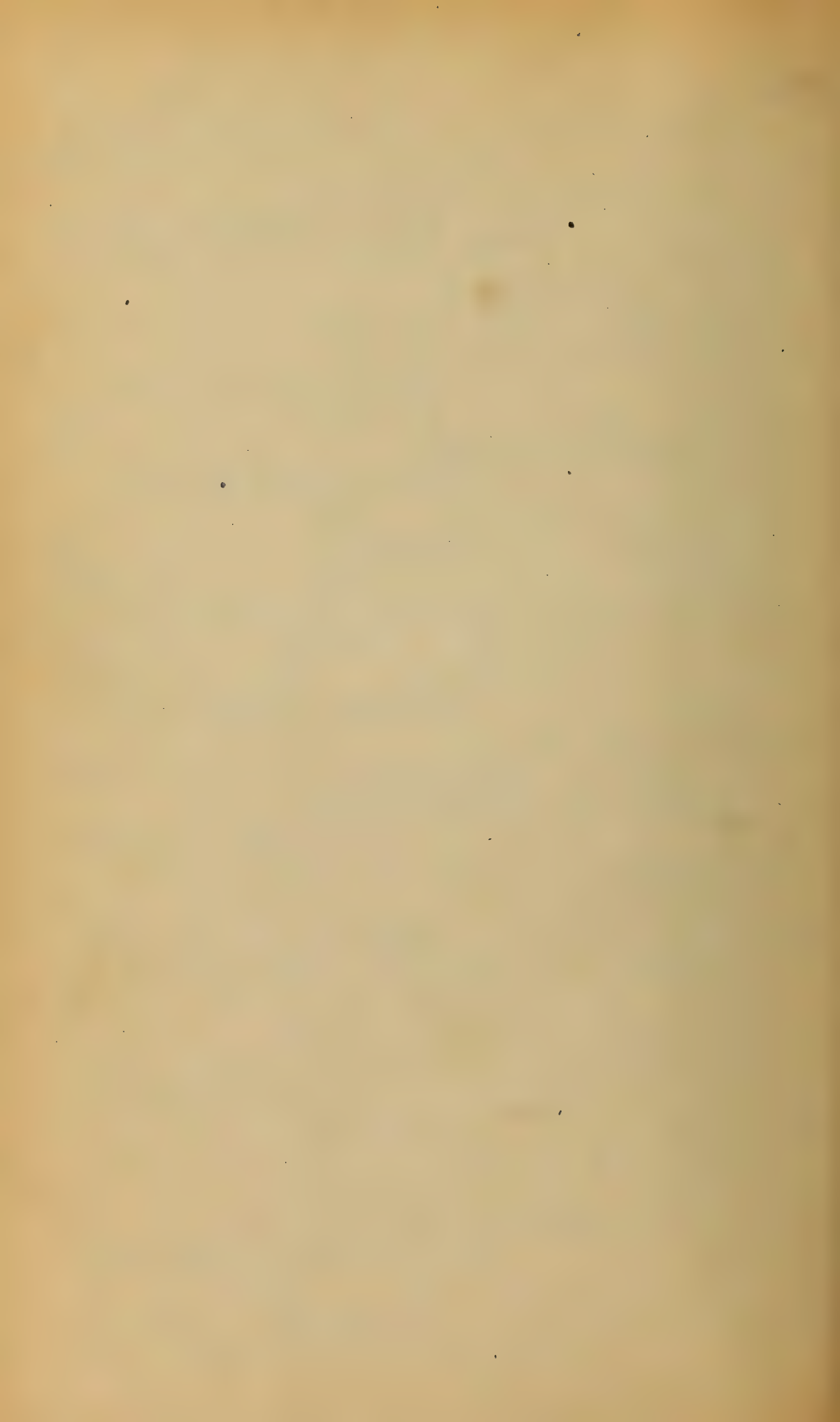
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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY—BULLETIN No. 63.

L. O. HOWARD, Entomologist and Chief of Bureau.

DIV. INSECTS

PAPERS ON THE COTTON BOLL WEEVIL AND
RELATED AND ASSOCIATED INSECTS.

I. HIBERNATION AND DEVELOPMENT OF THE COTTON BOLL WEEVIL.

By E. DWIGHT SANDERSON, *Formerly State Entomologist of Texas.*

II. NOTES ON THE BIOLOGY OF CERTAIN WEEVILS RELATED
TO THE COTTON BOLL WEEVIL.

By W. DWIGHT PIERCE, *Special Field Agent.*

III. AN ANT ENEMY OF THE COTTON BOLL WEEVIL.

By W. E. HINDS, *In Charge of Cotton Boll Weevil Laboratory.*

IV. A PREDATORY BUG REPORTED AS AN ENEMY OF THE
COTTON BOLL WEEVIL.

By A. C. MORGAN, *Special Field Agent.*

V. NOTES ON THE PEPPER WEEVIL.

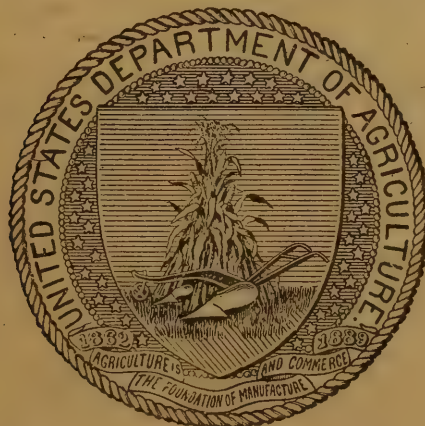
By F. C. PRATT, *Assistant.*

VI. THE STRAWBERRY WEEVIL IN THE SOUTH-CENTRAL STATES IN 1905.

By A. W. MORRILL, *Special Field Agent.*

VII. THE COTTON STALK-BORER.

By A. C. MORGAN, *Special Field Agent.*



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L. O. HOWARD, Entomologist and Chief of Bureau.

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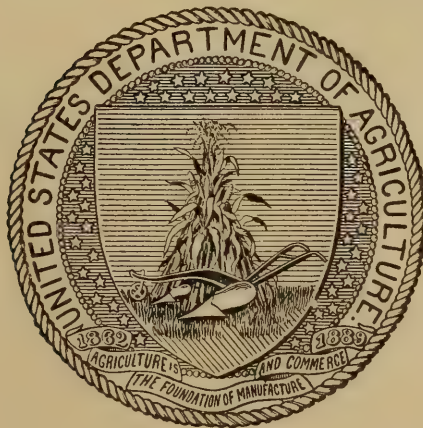
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY,
Washington, D. C., June 10, 1909.

SIR: I have the honor to transmit herewith, for publication as Bulletin No. 63, seven papers dealing with the cotton boll weevil and related and associated insects. These papers, which were issued separately during the early part of the year 1907, are as follows: Hibernation and Development of the Cotton Boll Weevil, by E. Dwight Sanderson; Notes on the Biology of Certain Weevils Related to the Cotton Boll Weevil, by W. Dwight Pierce; An Ant Enemy of the Cotton Boll Weevil, by W. E. Hinds; A Predatory Bug Reported as an Enemy of the Cotton Boll Weevil, by A. C. Morgan; Notes on the Pepper Weevil, by F. C. Pratt; The Strawberry Weevil in the South-Central States in 1905, by A. W. Morrill; The Cotton Stalk-Borer, by A. C. Morgan.

Respectfully,

L. O. HOWARD,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

HIBERNATION AND DEVELOPMENT OF THE COTTON BOLL WEEVIL.

By E. DWIGHT SANDERSON,
Formerly State Entomologist of Texas.

INTRODUCTION.

The most economical method of controlling the boll weevil is to destroy its food supply by burning or grazing the green cotton stalks in the fall before frost occurs, so as to reduce by starvation the numbers which go into hibernation. As it is known that a large proportion of weevils die during hibernation it may be readily understood that a much greater degree of benefit may be derived by destroying the weevils in the fall than by attempting to destroy them in the spring. The time at which the weevils enter hibernation, the numbers which attempt to hibernate, the mortality occurring during the winter and the factors which influence this mortality, and the time of emergence in the spring are, therefore, matters of practical importance upon which we have made careful observations.

HIBERNATION.

DATE OF ENTERING HIBERNATION.

Table I gives a summary of eight lots of weevils which were confined in cages at different dates during October and November, 1903. Altogether some 1,300 weevils were used in these experiments. Beginning with October 7 one cage was started each week until November 17. On November 18 a sharp freeze occurred, and almost immediately thereafter all weevils went into hibernation. It will be seen that in lots 1, 2, and 3 all of the weevils died prior to November 18. During the beginning of these experiments a plentiful supply of squares was furnished the weevils for food, but as they showed an inclination toward hibernating about the third week in October this supply was discontinued. In all cases the weevils which hibernated successfully

did not begin hibernation until about November 17 or 18. This was also true of other weevils under observation in the laboratory. The daily notes concerning one or two of the outdoor cages started in October are of interest in this connection. For example, lot 3 comprized 100 weevils put in hibernation cage with food October 16. The hibernation cages were wooden boxes 2 feet high and 1 foot square, with the sides about one-half open and covered with wire window screening, except the front, which was of glass. In the bottom of each cage was placed plenty of rubbish, consisting of fallen cotton leaves, rotten wood, etc. The weevils were thus exposed to the outside temperature, but were largely protected from rain. These cages were placed in various situations in a small grove and pasture at the apiary of the Agricultural and Mechanical College, College Station, Tex. The records kept of this lot and of lot 2 are as follows:

October 17, 18, no hibernation, weevils active; October 19, same, quiet in bottom of cage; October 21, sign of hibernation evident, some weevils congregate about dead rubbish on floor of cage; October 22, 23, 24, similar conditions, some seem to be hibernating; October 25, a few more in hibernating attitude; October 26, weevils are undoubtedly hibernating, shown by dormant attitude under rubbish; October 27, about all hibernating—if they were let out they would not hibernate, as some were let out, and they joined those in the field and commenced feeding; October 29, hot day arouses weevils to activity; October 30, think weevils die at the rate of 1 to 4 per day.

November 2, warm weather makes them exceedingly active; this continues until the 8th, when cool weather checks their activity; November 15, all weevils dead.

Lot 2.—One hundred weevils placed in cage October 8 and fed with squares; October 9, weevils lively, flying about in cage; October 10, 11, no signs of hibernation; October 12, less active; October 13, those on rubbish dead or dying; October 14, no signs of hibernation; October 18–23, weevils active, no hibernation; October 25, all but 8 dead, those hibernating under rubbish; October 29, weevils active; October 29–31, November 1, 2, sluggish; November 5, all dead.

TABLE I.—*Percentage of mortality of hibernating weevils.*

Lot.	Date placed in cage.	Number of weevils.	Date hibernated.	To November 18, 1903.			November 18–30, 1903.			December, 1903.						Died in December.
				Date.	Alive.	Dead.	Date.	Alive.	Dead.	Date.	Alive.	Dead.	Missing.	Total December 1.		
1	1903. October 7	100		Nov. 1		100.0										
				Oct. 24												
" 2	October 8	100		Oct. 25		92.0										
				Nov. 3		99.0										
				Nov. 5		100.0										
" 3	October 16	100		Oct. 30		(b)										
				Nov. 15		100.0										
4	October 23	100	Nov. 18	Nov. 18	100.0						14	7	71	22	71+	71+
5	October 25	300	do			9.0					4	67	33		82	71
" 6	November 1	200	do		50.0	50.0		23	50	50	26	18	82		61+	11+
7	November 9	200	do	Nov. 15	93.5	6.5					14	61	25			
8	November 17	200	do					25	100							
5+7	Average	500	do			8.0										
4,5,6	Average	600	do			21.0									75+	51+

^a Furnished with squares for food.

^b One to 4 dying per day.

TABLE I.—Percentage of mortality of hibernating weevils—Continued.

Lot.	Date placed in cage.	Number of weevils.	Date hibernated.	February, 1904.			March, 1904.			Total survived.	Date active.
				Date.	Alive.	Dead.	Date.	Alive.	Dead.		
	1903.				<i>Per ct.</i>	<i>Per ct.</i>		<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	
1	October 7.....	100	.....								
α 2	October 8.....	100	.....								
α 3	October 16.....	100	.....								
4	October 23.....	100	Nov. 18	(b)							
5	October 25.....	300	...do...	2	7.3	91.6	22	5.6	94.4	5.6	Mar. 22
α 6	November 1.....	200	...do...	(b)							
7	November 9.....	200	...do...				21	10.5	89.5		Mar. 18
8	November 17.....	200	...do...				24	7.0	93.0	7.0	
5+7	Average.....	500	...do...							6.2	
4, 5, 6	Average.....	600	...do...								

α Furnished with squares for food. b Accidentally disturbed and discontinued.

It will be seen from these experiments that weevils can not be forced into hibernation before the temperature declines to that point at which they normally hibernate, and that if deprived of food or confined much before that time most of them will die. The first weevils to go into hibernation were those of lot 4, placed in cages on October 23, but these did not actually hibernate until November 18. The case of lot 8, of 200 weevils placed in a cage November 17, in which all died by November 25, is difficult to explain. Our notes upon the condition of the weevils in the fields during the same fall show practically the same conditions as those existing in the cages. The very careful record by Mr. A. F. Conradi, made in fields in the neighborhood of the college, is briefly as follows:

September 6, 7, abundant, very few perfect squares, dry weather; September 8, 9, abundant, mating pairs common; September 10, abundant, practically all squares punctured, mating pairs less common; September 11, 12, less numerous, fewer mating pairs, few perfect squares; September 13, less abundant, perfect squares more common, mating pairs scarce; September 14, 15, less abundant, perfect squares more common; September 16–18, fewer weevils, perfect squares more common; September 19, less destructive than at any time since the 10th, perfect squares abundant; September 20–28, similar conditions; September 29, 30, conditions growing worse, more weevils, fewer perfect squares; October 5, numerous, eating vigorously; October 10, exceedingly abundant and destructive, a few dozen perfect squares found with great difficulty, smallest squares often punctured in several places; October 11, abundant, several on plants near field, one in door yard on house, mating common; October 12, 13, abundant, few mating, few perfect squares; October 14, many weevils found clustering about the base of bolls of all sizes just inside of the involucre, no signs of hibernation; October 16, 100 weevils found on 95 plants in thirty minutes; October 18, 19, weevils more sluggish, unusual numbers congregate behind involucre of larger squares; October 20, the size of weevils is exceedingly variable, more so than at other seasons, general depression in activity; October 22, some adults mating, no signs of hibernating; October 23–26, less numerous, no mating pairs, weather cool, beetles seem to be leaving; November 2, abundant in certain localities in the field; on 5 plants they average one to a square, then for a dozen or more none are found; mating common, but little egg laying for several days.

October 3, weather warm, weevils that had assumed a hibernating attitude lively again, mating pairs and oviposition common; October 4, much more active, mating pairs and number of eggs increasing, collected 100 weevils from 132 stalks; October 6, conditions similar to middle of September, collected 50 weevils from 46 stalks; October 7, weevils numerous, mating common, more egg punctures, collected 100 weevils from 92 stalks and 67 from 80 stalks; October 9, at apiary, 100 weevils on 98 stalks at east end, 50 on 100 stalks, west end, 48 on 90 stalks at the middle of the field; October 11, 90 weevils on 176 stalks; October 13, average of 1 weevil to 2

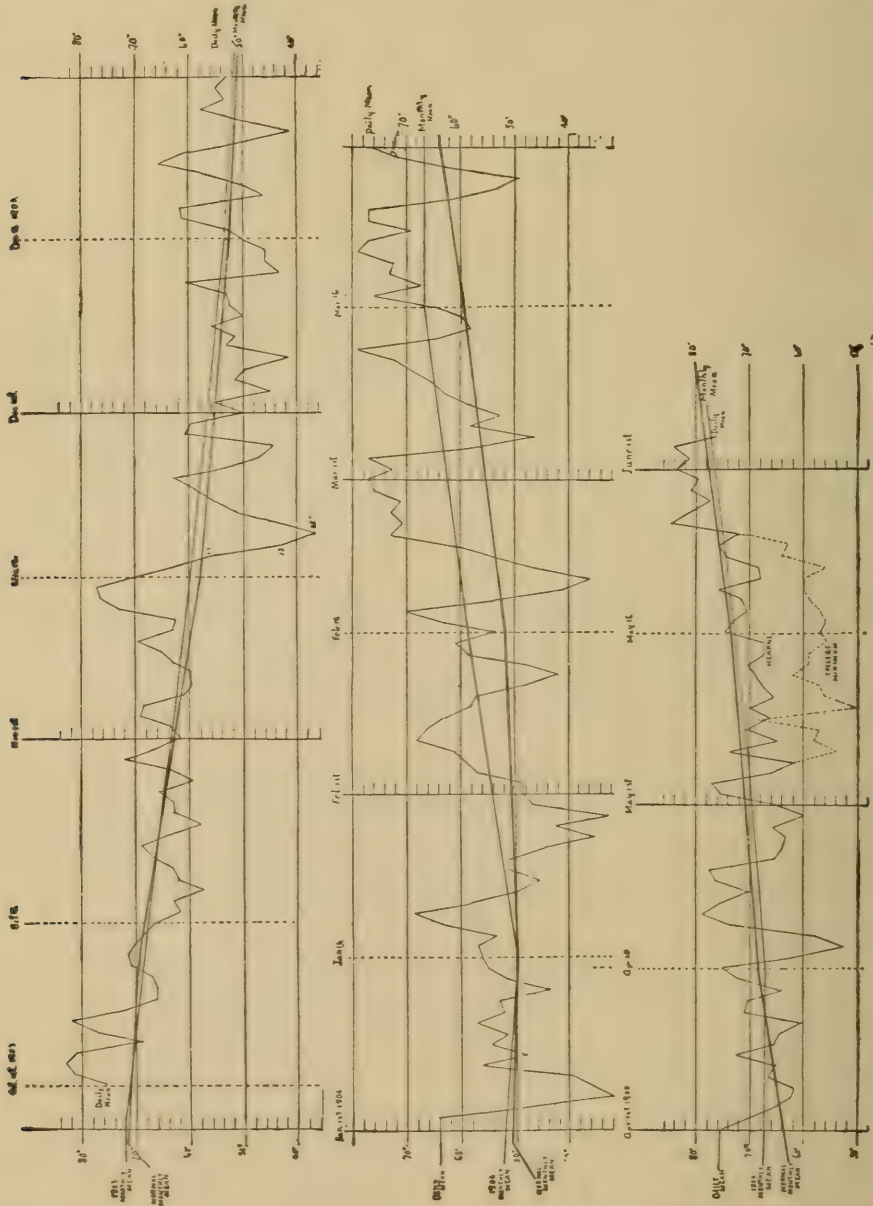


FIG. 1.—Daily temperatures at College Station, Tex., October 1, 1903, to June 15, 1904.

stalks; October 15, 16, weevils active, eggs common; October 17–21, low temperature, with sharp freeze on the night of the 18th, when the cotton froze and the supply of food was exhausted; October 22, after the 18th weevils went into hibernation rapidly, but diminution not markedly noticed until the 22d, when there was but 1 to 10 stalks.

The weevils were not injured by the freeze of the 18th, as many were found in the field on the 19th. By referring to figure 1, giving

the daily temperature,^a it will be seen that the activity of the weevils corresponds very closely with the rise and fall in temperature. Hunter and Hinds^b state that hibernation will commence as the mean average temperature falls to between 55° and 60° F., which our observations of last fall corroborate. They also state that at Victoria hibernation will normally commence about December 1. By referring to figure 2 it will be seen that the normal temperature at Victoria drops to 60° at about December 1 and at College Station from November 10 to 15. At Dallas hibernation would be several days earlier and for northeastern Texas generally about November 1 to 10. From the observations available, therefore, it would seem safe to assert that hibernation will usually occur when the mean average temperature drops below 60° F.

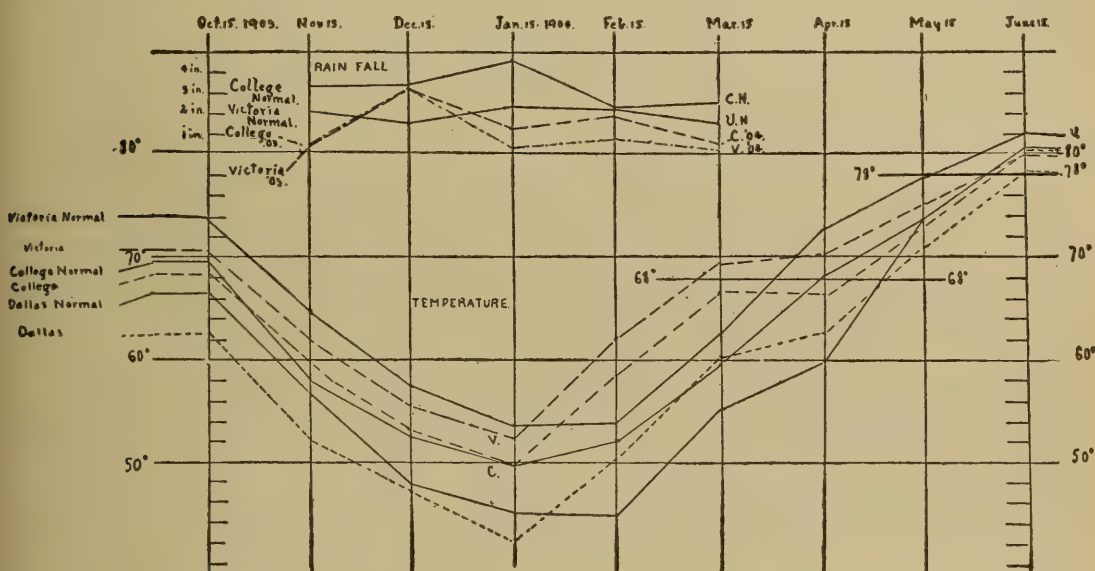


FIG. 2.—Rainfall and temperature records for College Station and Victoria in 1903-4 compared with normals.

NUMBER OF WEEVILS ENTERING HIBERNATION.

The number of weevils found in an infested field in the fall at about the time hibernation would normally begin is governed largely by the food supply and is influenced also by the temperature and rainfall during September and October.

^a Concerning the method of plotting the curves it should be stated that the vertical lines upon which the nodes of the curve occur are marked as being the 15th of the month. The mean temperature as given by the Weather Bureau is reported at the end of each month. If we should consider the node of the curve as occurring at the end of the month, we would misrepresent the facts, as during the spring and fall the temperature is on a gradual rise or decline. Consequently if the mean monthly temperature is given for the 15th of the month, the exact temperature for dates between these nodes can be more correctly ascertained from the curve. This applies also to the figures showing rainfall.

^b Bul. 45, Div. Ent., U. S. Dept. Agric., p. 81.

If during September and early October there should be a normal or excessive rainfall and the plants keep growing, there will be plenty of squares upon which the weevils may breed and multiply until frost occurs. If, on the other hand, during this period the weather should be hot and dry, the plants will stop growing and those infested squares which fall to the ground will be quickly dried up and but a relatively small number of weevils will be produced. This was strikingly shown in observations upon the number of weevils on cotton at the college in the fall of 1903 as compared with the fall of 1904. During September, 1904, there was an average of not over 3 squares to a plant, whereas in September, 1903, there was an average of about 40 squares to a plant. At this time during these two seasons there was approximately the same number of weevils in the field; but it can be readily seen that with so few squares in which to breed, in September, 1904, there would be far fewer weevils developed after September to go into hibernation.

Mr. Louis Teltschick states that in Lavaca County, Tex., at the time he turned cattle in to graze his cotton, October 17, 1903, there were about 2 weevils to a stalk. Concerning this he writes as follows:

I will state in this connection that in my opinion the bulk of the weevils had then left the cotton. I think that during the last three years the majority of weevils began leaving the cotton as early as September 1. They were undoubtedly compelled to do this by a scarcity of squares. To be more explicit I give you the following figures: On August 28, 1904, I estimated the number of weevils in my field at 12 per stalk. While I made no such estimate in 1902 or 1903, considering the extent of the injury worked by them in those years, I think that their numbers on the same date might safely be put at 6 for 1902 and 9 for 1903. When I cut the stalks early in October, 1902, I found that there were about $1\frac{1}{2}$ weevils per stalk, and in October, 1903, when I turned the cattle in, there were about 2 weevils per stalk. You will see that according to these estimates from 75 to 80 per cent of the weevils infesting the fields on August 28 in those years had disappeared by October 15, leaving out of account all weevils hatched between the two dates. Where they went or what became of them I am unable to say. They may have gone to uninfested regions, or they may have died or gone into hibernation quarters when squares became too scarce to supply all of them.

These observations merely confirm our previous statement that the number of weevils in the fall is controlled entirely by the food supply.

One of the principal factors in cutting off the food supply of the boll weevil in the fall is the cotton leaf-worm or so-called "army worm" (*Alabama argillacea* Hbn.). Whereas this insect was formerly considered to be the great scourge of the cotton planter, it may now be said to be an almost positive advantage in territory affected by the boll weevil, as its injury does not ordinarily occur until after the crop has been made, and all further fruiting would be prevented by the boll weevil. As soon as the leaf worms have stript the cotton of foliage and squares the weevils either die or leave for fields where they may obtain food. This was strikingly shown in an examination of four

plats at Smith & Carson's plantation on September 14, 1904. In plats 1-3, where the leaf worm had stript the plants clean of foliage, but 8 weevils were found to 100 stalks and but 40 per cent of the squares were punctured. On plat 4, immediately adjoining these plats, which had not been so seriously injured by the leaf worm, there were 27 squares to a plant, 148 weevils to 100 stalks, and 70 per cent of the squares were punctured.

Mr. Teltschick has given us some interesting observations upon the leaf worm, as follows:

As far back as I can remember—some twenty-odd years—the people here (Lavaca County) had to fight the leaf worm every year. Arsenic, Paris green, and London purple were used with varying success. At first the worms made their appearance as early as June and frequently hatched in such numbers as to enable them to sweep a field clean in less than 48 hours. Gradually, however, this wave of worms subsided; that is to say, they made their appearance later and later in the season, and became fewer in numbers, until finally when the boll weevil made its first appearance, their coming was no longer viewed with alarm. On the contrary they were often welcomed by the farmers, inasmuch as they cleared away the thick foliage of the cotton plant, thus often saving a considerable number of the bolls at the bottom, which would otherwise have rotted for the want of light and air.

At the time of the weevils coming here (seven or eight years ago) the worms were no longer regarded as a menace to the cotton crop; they made their first appearance then either late in August or early in September. They kept this up practically until in 1902 and 1903 they failed to come at all. This year (1904) they reappeared early in September and completely stript cotton of its foliage. The second destructive brood of worms is just now (October 2, 1904) hatched, and there is every reason to believe that they will keep the stalks bare until frost as they did in former years. It will have to be admitted that during 1902-3, when cotton grew and formed squares undisturbed up to the first frost, which occurred in December of both years, an opportunity was given the weevil to go into hibernating quarters later in the season and in greater numbers than would have been the case had the further growth of cotton been prevented either by man's or nature's means.

Thus the leaf worm accomplishes practically the same result as is obtained by grazing stalks with cattle and may be considered a most valuable ally.

The number of weevils which go into hibernation may of course be decreased by the thoro grazing of the cotton with cattle before frost, or by cutting, plowing out, and burning the stalks. It is safe to say that by a thoro fall clearing of the ground the number of weevils entering hibernation can be decreased at least 75 per cent. Weevils in all stages are thus immediately destroyed, and if the land is cleared of cotton a month before the normal hibernation period the weevils then escaping are almost certain to starve, as has been shown in Table I, before it becomes cold enough for them to hibernate.

Under normal conditions, as noted in Table III, column 3, the number of weevils to a stalk at the time of hibernation will vary from 1 for every 2 stalks to 2 for each stalk in badly infested fields, the number depending, as before stated, entirely on the food supply and

weather conditions. There seems to be no reason to believe that any difference will be found in the number of weevils in infested fields in northern Texas as compared with southern Texas except as it may be controlled by these factors, for after the third brood becomes matured the number of weevils depends entirely upon these conditions.

DEVELOPMENT OF IMMATURE STAGES DURING NORMAL PERIOD OF HIBERNATION.

In southern Texas during an open dry winter larvæ, pupæ, and adult weevils may frequently be found in the injured bolls hanging upon the cotton stalks. In feeding upon the bolls the larvæ frequently eat a hole thru the septum between two locks and form a small cavity just under the inner surface of the lock. These feeding cavities become lined by the dried and hardened excrement, so that when a lock is broken to pieces the weevil cells may be separated out and have quite the appearance of seeds. It is within such cells that the immature stages pass the winter in the bolls. Occasionally, however, the larvæ eat into the seed, so that immature stages may be found actually within the seeds. This is undoubtedly not the usual habit and there seems to be practically no danger of disseminating weevils actually secreted inside of the seeds. We have been unable to make a personal examination of these conditions, but on February 20, 1903, Mr. W. P. Allgood, of Devine, Medina County, Tex., wrote us sending some cotton bolls and seed, in which we found 4 weevils alive, 1 dead, 1 newly transformed, 1 in a seed, and also 2 seeds which seemed to have been eaten out by weevil larvæ, but which contained only larvæ which may have been parasitic upon the weevil. The 4 live weevils were kept in a tube in our laboratory until about April 1, when they died, owing to the unsuitable conditions.

Several of the infested seeds were evidently entered before the shell was fully hardened and the normal development of the seed prevented, whereas in other cases the weevils were in seeds fully developed. It seems quite reasonable that the larvæ should bore into the seeds during the early winter, for as the cotton matures the seeds would be more succulent. However, it seems exceedingly improbable that weevils could be disseminated by being carried in the seed, for they occur within the seed only on unopened bolls which hang upon the plant, and very rarely would cotton in which weevils had entered the seed ever be ginned.

Early in March of the same year Mr. Allgood sent the writer quite a quantity of bolls, which were examined March 12 with the following results: Out of 200 bolls 165 contained no weevils in any stage, alive or dead, but of these, 20 per cent had been noticeably injured by weevils. Forty, or 20 per cent, contained weevils alive or dead in some stage. In these 40 bolls there were 40 live and 11 dead pupæ,

30 live and 40 dead adults, and 5 dead larvæ. Many of these weevils had just transformed from pupæ and were still soft and light brown. Some transformed after being received. But one live larva was found in all the material examined. Mr. Allgood wrote the writer that these bolls had been collected from stalks in a neighbor's field in which there were 7,000 plants to the acre, that each plant held from 12 to 15 bolls, and that the bolls sent in were picked at random from the field. Upon this basis, disregarding the live pupæ but counting the 30 weevils which were found alive as having survived the winter, there would have been 10,500 weevils per acre in the spring. If but one-third of these survived there would have been 3,500 per acre, or more than have ever been recorded in any field observations. If, as seems quite possible, but one-fifth survived, there would have been 2,100 per acre, which is approximately the number which survived in Lavaca County under the favorable weather conditions of the winter of 1903-4. Mr. Allgood wrote that cattle were then grazing in these fields, but it is doubtful if the cattle would have eaten many of the dry hardened bolls. In another lot of 48 bolls and forms sent by Mr. Allgood at the same time, we found 18 uninhabited large bolls, 15 forms, and 15 small bolls. These contained 17 live weevils, 4 live pupæ, 4 dead pupæ, and 2 dead larvæ, or one live weevil to every 3 bolls or forms. These weevils were confined in a wooden box in the laboratory and were still alive April 10, but later died, as no food could be supplied them at that time under temperature conditions such that they would normally have emerged. Doubtless they would all have emerged early in April at Devine. The temperature at Pearsall, the nearest weather station to Devine, during the winter was as follows: December, 1902, mean 54° , lowest 30° ; January, 1903, mean 51.8° , highest 80° , lowest 29° ; February, 1903, mean 52.8° , highest 77° , lowest 23° ; March, 1903, mean 60.6° , highest 82° , lowest 38° .

It will be seen that there were but few days during the winter in which the temperature was below freezing. The total mean temperature for these four months at Pearsall was but 63° less than the total normal mean for southwestern Texas during this time, and the rainfall at Pearsall was but 6.34 inches greater than the normal for southwestern Texas, no normal records for Pearsall being given. The total rainfall of these months is normally but 7.51 inches for southern Texas, so that the rainfall was nearly double the normal and the winter would appear to have been exceedingly unfavorable for the hibernation of weevils in their usual places of shelter. However, weevils which developed in the unopened bolls were almost entirely protected from the excessive rainfall, and the temperature being normal they would probably survive, while those weevils which went into hibernation in all usual places in the fall would doubtless have suffered an excessive mortality due to the unusual rainfall.

Immature stages and adult weevils are often found in early winter in the unopened bolls hanging on the stalks thruout the infested regions. We received live adult weevils in bolls from Hamilton, Hamilton County, in December, 1903, and they have been observed here and elsewhere, but we have no record of weevils having been found alive in these situations in early spring in central Texas, and it is exceedingly doubtful if many of them would survive the winter except in southern Texas.

TABLE II.—Condition of immature stages of weevils after date of normal hibernation.

Lot.	Date.	Number of squares or bolls examined.	Contain- ing eggs.		Containing larvæ.					Containing pupæ, per cent of total.	Per cent of squares from which weevils emerged.	Per cent of squares show- ing weevil injury, but no stage present.	Remarks.
			Per cent of total.	Percent unhatched.	Per cent of total.	Per cent less than half grown.	Per cent over half grown.	Per cent alive.	Per cent dead.				
1	1903. Nov. 13	a 550	9.15	.....	25.5	.....	.....	.....	.....	0	.....	40.5	Collected Nov. 7. Squares frozen Nov. 18. Collected from plant Nov. 15.
2	Nov. 12	a 98	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	
3	Nov. 18	a 50	8	.....	24	10	14	.....	.....	0	.....	.....	
4	Nov. 20	a 200	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	
5	Nov. 22	a 100	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	Collected from ground Nov. 22.
6	Nov. 28	a 100	.....	.....	2	.....	.....	100	.....	.....	9	.....	Collected from ground Nov. 8.
7	Nov. 26	a 200	.....	.....	4	.....	100	100	.....	.....	4	.....	One-half collected from ground, one-half from plant, Nov. 1.
8	Nov. 30	a 200	.....	.....	2	.....	100	100	.....	.....	1	.....	One-half collected from ground, one-half from plant, Nov. 15.
9	Dec. 4	a 200	.....	.....	.....	.....	.....	.....	.....	.....	b 100	.....	One-half collected from ground, one-half from plant, Nov. 18.
10	do....	a 200	.....	.....	.....	.....	.....	.....	.....	.....	b 100	.....	One-half collected from ground, one-half from plant, Nov. 22.
11	do....	a 200	.....	.....	.....	.....	.....	.....	.....	.....	1	b 99	One-half collected from ground, one-half from plant, Nov. 24.
12	Dec. 12	{a 200 c 100	.....	.....	.....	.....	.....	.....	.....	.....	b 100	.....	One-half collected from ground, one-half from plant, Nov. 28.
13	Dec. 5	a 250	.....	.....	.....	.....	.....	.....	.....	.....	b 100	.....	b 87.2 b 95.8 b 96
14	do....	c 250	.....	.....	12.8	.....	.....	.....	100	.....	.....	.....	
15	Dec. 4	a 500	0	.....	42	57	43	100	.....	0	.....	.....	
16	do....	c 200	.....	.....	4	.....	100	.....	100	0	.....	.....	

a Squares.
b Squares with no stage of weevil in them. Percentage injured unknown, but probably 40 per cent as in lot 1.
c Bolls.

In November and December, 1903, Mr. Conradi made careful observations at College Station upon the condition of the immature stages after the freeze of November 18. The results of these observations are shown in Table II. It will be noticed that no pupæ or adults were found in over 3,600 squares and bolls examined, showing that egg laying had temporarily ceased during some period before November 1. The most probable explanation of this remarkable absence of

pupæ and adults in the presence of eggs and larvæ is that an outbreak of the cotton leaf-worm (*Alabama argillacea* Hbn.) had completely defoliated the plants during the latter part of September, preventing entirely the formation of squares, and thus stopping abruptly for a short time the multiplication of the weevils in squares. Subsequently squares were formed, and when these became large enough the reproduction of weevils was resumed after about November 1, so that most of the larvæ found were over half grown. In lots 4 and 5, when examined November 20 and 22, from 10 to 12 per cent of the eggs were still unhatched. It seems probable that at this time some of the eggs, but no large percentage, failed to hatch. Most of the larvæ died during the first stage and but few lived to be over half grown. On November 12, in lot 2, 25 eggs were found in 98 squares, which were collected November 7, showing that the egg period had been doubled. Mr. Conradi notes in this connection that the life-history period was first noticed to be decidedly lengthened after November 9, eggs laid November 10 requiring 5 days to hatch. From 24 eggs hatched between November 24 and 28, 15 larvæ died within a day after hatching, 7 by the time they were half grown, and but 2 developed into weevils, which emerged December 4.

On December 12 an occasional larva was found in the field and several were brought into the laboratory, where 3 transformed to pupæ January 7, but then died. They would undoubtedly have failed to pupate in the field.

MORTALITY OF HIBERNATING WEEVILS.

The mortality of weevils during hibernation is shown in Tables I and III. Table I gives the mortality of weevils confined in cages at different dates from October 7 to November 17, as previously described. In but two lots did weevils survive the winter. In these lots (5 and 7), of 500 weevils an average of 6.2 per cent survived the winter and were active between March 22 and March 24. On March 21, however, 10.5 per cent were alive, and it was noted that these weevils had been active since March 18, so that practically 7.5 per cent of the two lots survived the winter under the supposedly favorable conditions furnished them in the hibernation cages.

TABLE III.—Percentage of weevils surviving hibernation in fields.

Year.	Locality.	Number of weevils to a stalk in fall.	Weather: December- March.				Date first emerged.	Dates counted, inclusive.	Weevils counted.	Area counted.	Number of weevils to 100 stalks.	Percentage survi- ving hibernation.
			Rainfall.		Tempera- ture.							
			Win- ter.	Nor- mal.	Win- ter.	Nor- mal.						
1900-1	Vienna <i>a</i> .....	.....	<i>b</i> +5.54	8.32	+ 2.7	55.8	Mar. 10	.....	.....	10 acres.....	.....	.....
1902-3	do.....	1.5	+6.86	8.32	+ .5	55.8	.....	.....	.....	$\frac{1}{2}$ acre <i>c</i>.....	.....	.....
1903-4	do.....	(?)	-5.08	8.32	+14.1	55.8	Mar. 15	May 17 <i>d</i>	2,400	1 acre.....	31.0	<i>d</i> 30
1900	Booth.....	.....	<i>e</i> +5.71	14.47	- 5.0	55.5	.....	May 22-31.....	2,000	2 acres.....	13.0	13
1903	Hunter.....	.....	<i>f</i> +9.60	7.02	- .8	54.7	.....	May 30.....	6	140 stalks.....	4.0	.....
1902	Wellborn.....	.....	<i>g</i> -8.84	13.40	- 9.1	55.7	.....	May 22-29.....	397	2 acres.....	2.5	2.5
1903	do.....	<i>h</i> 2.00	<i>g</i> +2.91	13.40	-11.6	55.7	May 8	June 26- July 17.....	1	2,125 stalks.....	.04	.08
1903-4	do.....	1.00	<i>g</i> -2.45	13.40	+ 2.1	55.7	Apr. 17	May 20- June 17.....	26	1,600 stalks.....	1.6	1.6
1903	College Sta- tion. <i>i</i> .....	.....	-1.38	12.72	- 3.5	53.6	May 15	June 18... ..	5	940 stalks.. ..	.5	.....
1903	do. <i>k</i> .....	.....	-1.38	12.72	- 3.5	53.6	.....	.....do.....	2	40 stalks....	5.0	5.0
1904	do. <i>l</i>	.75	-6.12	12.72	+14.1	53.6	Mar. 29	May 19- June 14.....	49	2,930 stalks.....	1.66	1.66
1904	do. <i>m</i>	1.00	- 6.12	12.72	+14.1	53.6	Apr. 1	May 22- June 9.....	20	1,840 stalks.....	1.0	1.0
1904	Rosprim. <i>n</i> ..	(?)	-6.12	12.72	+14.1	53.6	Apr. 8	June 7....	10	1,000 stalks.....	1.0	.....

a Observations by Louis Teltschick.

b Record for Hallettsville.

c Three-fourths-acre trap rows.

d Estimate of several fields, May 17.

e Records of Houston, as far as given.

f Record for New Braunfels.

g Records for Brenham.

h August 17, 2 weevils per 100 stalks.

i In sorghum in 1902.

k Cotton, 1902, a crossroad by barn.

l Cotton not destroyed in fall of 1903.

m Cotton destroyed in fall of 1903.

n In corn in 1903.

In the field we have never found the percentage surviving at the college to approach this number, except in one instance. As shown in Table III, in the spring of 1903 cotton was planted near the college barn, where it had been grown the previous year and left standing. The weevils had the most favorable conditions possible for hibernating around the barn. They appeared so numerous on the cotton in the following spring that on June 18 there were 5 hibernated weevils to every 100 stalks. More weevils were found in this cotton thruout the year than in any other locality. If it be fair to assume that about one weevil to a stalk occurred in this field at the time of hibernation in the fall of 1902, then about 5 per cent survived. It is quite possible that there were more than this number in the fall, and the percentage surviving would therefore be somewhat less. Elsewhere, in the neighborhood of the college, not over 2 per cent have ever been found to survive the winter in the field, tho several fields within a distance of 4 miles have been carefully observed.

In the Brazos bottom, on Smith & Carson's plantation, Professor Mally (report,^a p. 16) records picking 397 weevils from 2 acres May 22-29, 1902, or 2.5 weevils to 100 stalks, which would give not over 2.5 per cent surviving hibernation. In 1903 but 1 weevil was found to 2,125 stalks, or 0.04 to 100 stalks, which would give a percentage of hibernation of not over 0.04 and probably 0.08, as there were 2 weevils

^a Report on the Boll Weevil, Austin, Tex., August, 1902.

to a stalk the previous fall. During the present year (1904) but 1.6 per cent survived hibernation on the plots counted. This figure is open to slight error, as upon this plantation there were possibly 20 acres of cotton about a mile away, which were planted much earlier than was most of the plantation. This early cotton was infested at the rate of 20 weevils to 100 stalks on May 31. It is evident that the weevils which hibernated on the plantation as a whole had concentrated on this early planting, but if the total number of weevils upon this early cotton had been distributed over the whole acreage there would have been not over $2\frac{1}{2}$ weevils per 100 stalks or 2.5 per cent surviving hibernation at the most. Two per cent would probably be very nearly correct. At Victoria, Hunter and Hinds have shown that approximately 15 per

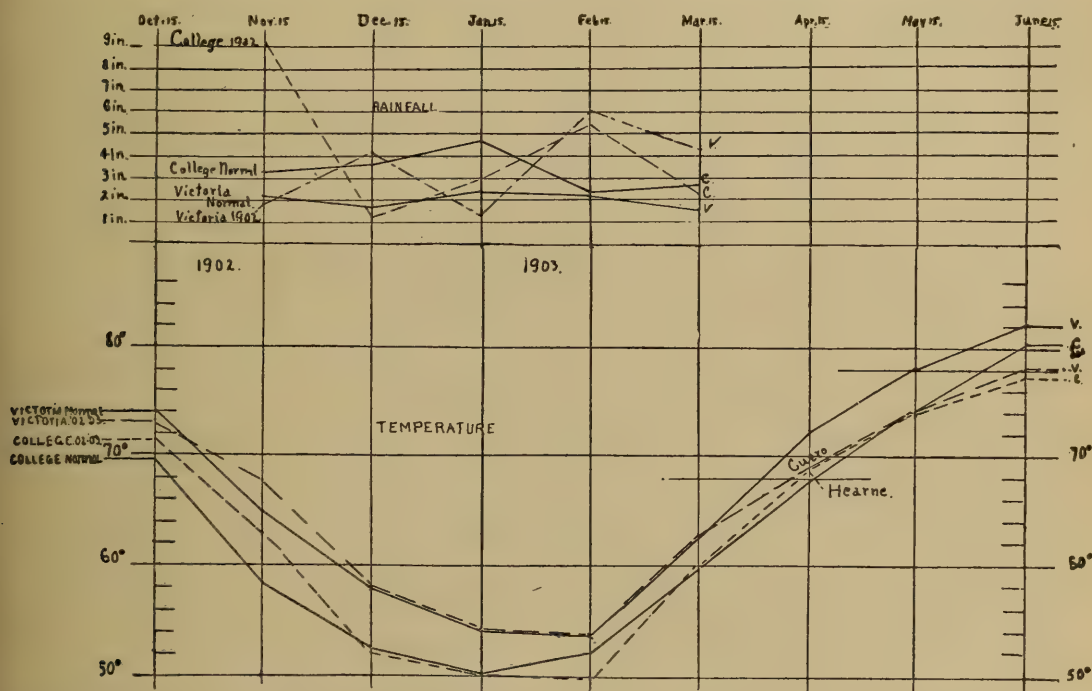


FIG. 3.—Rainfall and temperature records of College Station and Victoria, Tex., for 1902-3, compared with normals.

cent of late-developed weevils survived the winter of 1902-3 in hibernation cages. The very careful records made by Mr. Teltschick by hand-picking the weevils during the spring (see p. 59 of that report) shows that this very closely approximates the number of weevils normally surviving under field conditions in Lavaca County, but that during the last winter (1903-4) fully 30 per cent of the weevils, or twice as many as usual, hibernated successfully. In 1900 Professor Mally's records (l. c., p. 32) show that Mr. Kramer picked 2,000 weevils at Booth, Fort Bend County, or 13 to 100 stalks, which would give at least 13 per cent surviving the winter, in a latitude practically the same as that of Vienna. It will be seen, therefore, that whereas 15 per cent may be considered an average of the number surviving

hibernation in southern Texas, normally only about 2 per cent, and never over 5 per cent, survive under field conditions at College Station, and about $2\frac{1}{2}$ per cent in the Brazos bottom at Wellborn. In other words, only about one-fifth as many weevils survive the winter here as do in southern Texas. Whether a corresponding difference will be found in the mortality between central Texas and northern Texas remains to be determined. This will depend on the weather conditions discust below, but it seems doubtful that there will be so great a difference.

TIME OF GREATEST MORTALITY DURING HIBERNATION.

In Table I it may be seen that in lots 4, 5, and 6, including 600 weevils, there was a mortality of at least 51 per cent during the month of December, and that in lot 5 there was a mortality of 9.6 per cent during January and but 2.8 per cent during the remainder of the year. Referring to figure 2 it may be seen that at College Station in the winter of 1903-4 the rainfall was greatest in December, while during the balance of the winter it was below normal. The maximum in December approached the normal, whereas usually the maximum for winter occurs in January. The temperature was very close to normal thru January, but considerably above normal during the remainder of the winter.

In general, an excessive rainfall seems to be a most important factor in increasing the mortality of the weevil. The temperature does not usually depart sufficiently from the normal to be an important factor, except that when occurring with a deficient rainfall an excess of temperature appears to be decidedly beneficial to hibernation. By referring to figures 4 and 5, showing the normal rainfall and temperature for Hallettsville, Tex., and the monthly mean temperature and rainfall during the winters of 1899-1900, 1900-1901, 1902-3, and 1903-4, it may be seen that in 1900-1901 there was a decided deficiency in rainfall and a slight excess in temperature, whereas in 1902-3 there was an abnormally large rainfall and a nearly normal temperature. In 1901 and 1904 the weevils survived in unusually large numbers, while in 1903 the number hibernating successfully was considerably less than normal. The same general conclusions are shown when the rainfall and temperature records as given for College and Brenham in Table III are compared with the percentage of weevils surviving at College and in the Brazos bottom below Wellborn. The rainfall and temperature records are shown diagrammatically in figures 2 and 3, giving also the normal rainfall and departure from normal for College Station and Victoria in 1902-3 and 1903-4.

If it be true that the rainfall is the most important climatic factor in the mortality of the hibernating weevils, it is interesting to compare the rainfall of different sections of the State as given by the

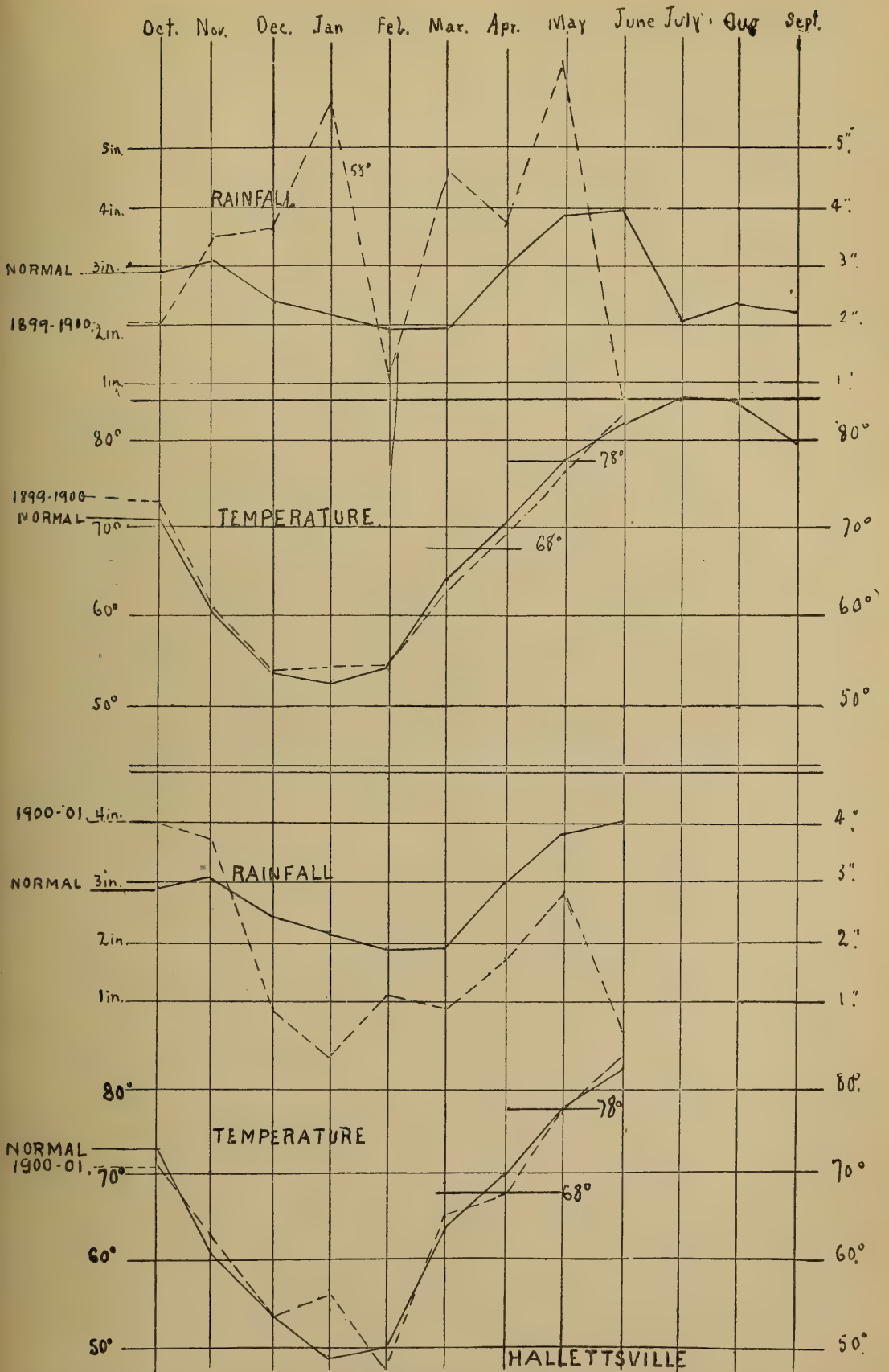


FIG. 4.—Rainfall and temperature records, Hallettsville, Tex., 1899-1901, compared with normals for each year.

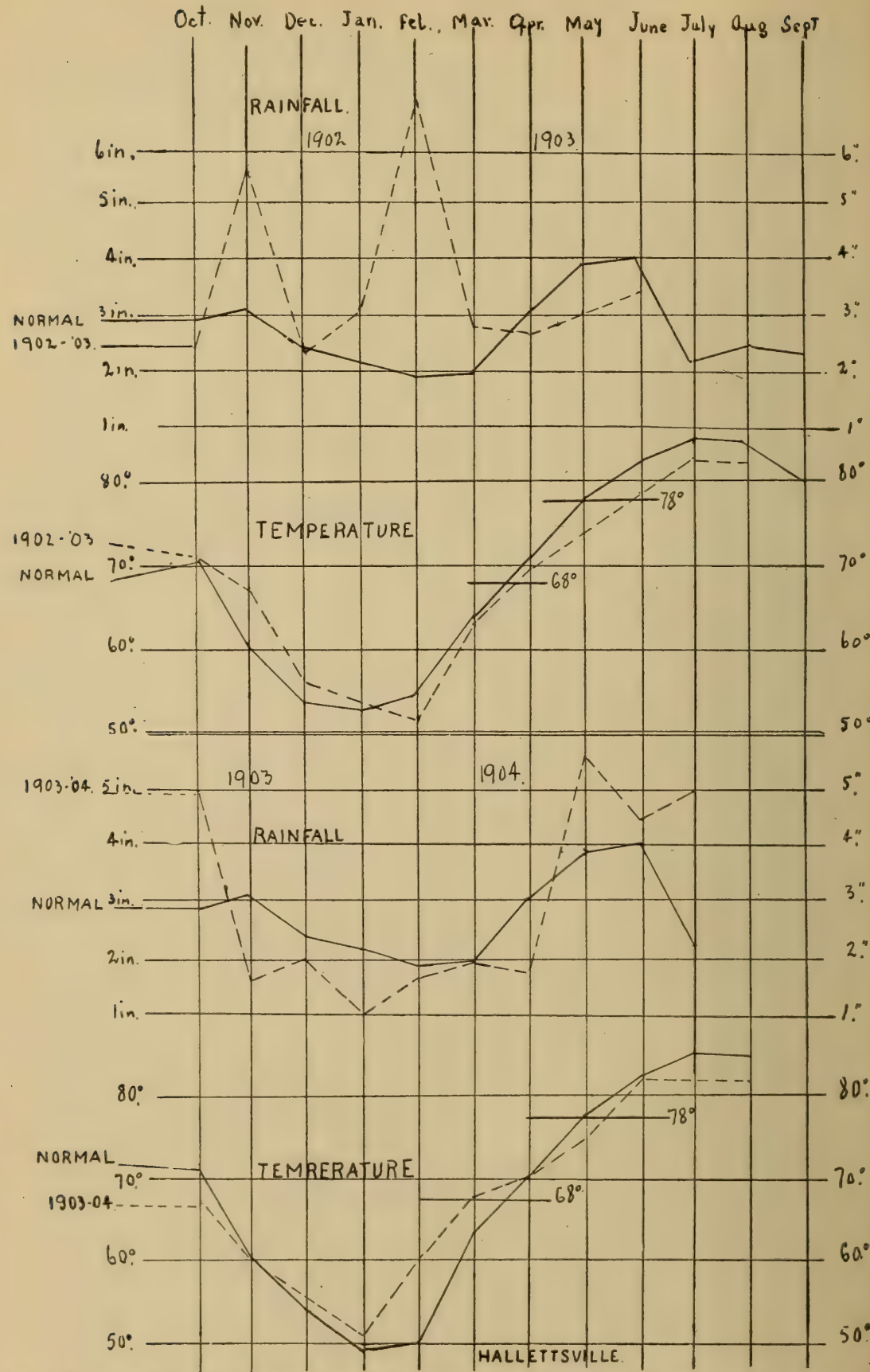


FIG. 5.—Rainfall and temperature records, Hallettsville, Tex., 1902-1904, compared with normals for each year.

Texas section of the U. S. Weather Bureau. The normal total rainfall during the winter months of December to March for southwestern Texas is 6.46 inches, for the coast country 8.26 inches, and for central Texas 9.83 inches, while the total normal effective winter temperature^a during December to March, inclusive, is, for southwestern Texas 1,631.4° F., for the coast country 1,190.6° F., for eastern Texas 1,483.1° F., for northeastern Texas 934.9° F., and for central Texas 1,294.3° F. The average effective temperature for the eastern and southwestern countries is therefore from 200° to 300° higher than that of central Texas for this period and from 450° to 700° F. higher than that of the coast and northeastern Texas. If we consider the more critical period of December to February, inclusive, the southwestern and eastern countries have 300° to 200° F. more effective temperature than central Texas and from 600° to 500° F. more than northeastern Texas. It would therefore seem that both the temperature and rainfall are far more favorable to the successful hibernation of the weevil in southwestern Texas than in central, coast, or northeastern Texas, and that the conditions as to temperature and rainfall in the coast country during the critical period are very similar. In northeastern Texas, however, as the weevils do not emerge from hibernation until considerably later in the spring, the larger rainfall occurring during April may have some effect on them.

As before mentioned, floods during the period of hibernation seem to have a marked effect upon the mortality of the weevil, as there were notably fewer weevils thruout the Brazos bottom in this section in the spring following the flood of February, 1903.

PLACES OF HIBERNATION.

Considerable time has been spent in attempting to find the places in which the weevils spend the winter, but the results have been rather unsatisfactory. This has also been the experience of many observing practical farmers. Numerous cotton fields were examined in the neighborhood of the college during January and February, 1903, and tho Mr. Newell and the writer made diligent search in all conceivable places over a considerable acreage, embracing an area of 2 miles, examining cornstalks, grass, bark, fence posts, gins, etc., we found but 1 live boll weevil during the winter and this one was under a small pile of dried manure. On November 29, 1903, Mr. A. F. Conradi found 2 weevils in a pile of old cotton brush in our experimental field, 3 under the bark of a log near the field, and 2 in the cotton field under a bunch of dead cotton leaves. On December 15 a thoro examination

^aTotal normal effective temperature is reckoned for each month by subtracting 43° F. (the point at which animal activity is supposed to begin) from the normal mean temperature for that month, multiplying the difference by the number of days in that month, and adding together the four products thus obtained.

was made of logs, leaf rubbish, etc., in a ravine adjoining our cotton field, but no weevils were found. On December 28 a similarly futile search was made along Carters Creek, in which neighborhood a good deal of cotton had been grown. On January 5, 1904, a 30-acre cotton field was thoroly examined, but no weevils were found. Corn stubble standing near a very badly infested field was also examined without finding any weevils. Our information regarding the hibernating places of the weevil is therefore more of a deduction based upon observations of the places in which they appear first in the spring than a conclusion from actual observations. The observations by Mr. Conradi in the early winter probably indicate the normal places for hibernation—that is, under dead leaves, in old cotton brush, and under loose bark. In the hibernation cages, where the weevils were furnished an abundance of rubbish, it was found that many of them which were hibernating successfully had crawled into the cavities made by borers in dead wood and in similar positions where they were well protected. It has been often noticed that in a wooded country the weevils appear first in spring along the borders of fields next to the woods and gradually work inward from the edges, so that it seems probable that in a wooded country most of them hibernate in woodland. Around outbuildings and barns also are found favorable places, as there is always more or less rubbish and protection in such situations. In 1903 more than five times as many weevils were found in a piece of cotton near the college barn, where cotton had been grown the previous year, than were found in any other locality in that neighborhood. It is also noticeable that weevils are always more numerous near gins than at a distance from them. Undoubtedly, where much rubbish and grass are present and where the soil remains loose and is not packed by rains, large numbers of the weevils winter in the cotton fields. The fact that in 1903 an exceedingly small number of weevils survived on Smith & Carson's plantation on the Brazos River must have been due to their having hibernated in the field, large numbers having been killed off by the excessive rains and doubtless more by the flood of February, 1903, which covered the fields to a depth of several inches over a large part of the plantation. It was quite noticeable that few weevils were found on Brazos bottom plantations in this section in 1903. In all probability the flood would have had but little effect later in the season after the weevils had emerged.

It is noticeable that weevils are much more abundant where cotton is planted in fields where sorghum stubble has been allowed to remain all winter adjoining a last year's cotton field. Thus, in the spring of 1904, the first weevils found on Smith & Carson's plantation were on a cut of cotton along the Brazos River which had been in sorghum and surrounded by cotton in 1902 and where several large sorghum stacks stood thru the winter. Tho planted early and kept well cultivated,

so little cotton was made on this piece that it was not worth picking, while cotton planted at the same time and cultivated in the same manner on other parts of the plantation made a good yield.

Professor Mally (l. c., p. 57) has given the observations of Mr. Teltschick upon finding weevils hibernating in the crevices of the soil around the cotton stalks and roots, at a depth of 3 inches. On March 7, 1901, a raw, windy day, upon 35 stalks, he found 7 live and 2 dead weevils from 1 to 3 inches below the surface. In September, 1902, he stated that he had again found weevils in a similar situation during the previous spring, but not as many of them as in 1901. Mr. Teltschick recently writes as follows:

I found but few weevils in crevices around stalks during the last two winters, partly because there were no crevices (frequent rains filling them up as soon as formed) and partly because freezes were severe enough to keep cotton from coming out during any part of the last two winters; whereas in 1900 we had neither rain enough to fill up crevices nor frost enough to keep cotton from budding out at intervals at the base of the stalk, which latter fact accounts, no doubt, for the relatively large number of weevils found within the crevices.

TIME OF EMERGENCE FROM HIBERNATION.

Hunter and Hinds^a state that the first weevils emerge when the mean average temperature has been for some time above 60°. Our observations at the college upon the earliest emergence from hibernation are as follows: In 1903 the first weevil was found on May 15 at the college after carefully searching about 100 feet of unchopped row. Repeated examinations during the next two weeks showed but a very small number of weevils. On May 8 a weevil was found in the Brazos bottom after hunting about 20 minutes, and after May 5 planters in the bottom occasionally reported finding weevils. In 1904, on cotton planted March 17, the first weevils were found on March 29. On April 17 and 18 only an occasional weevil could be found at College Station or in the Brazos bottom after a considerable search. In 1903 Mr. Teltschick wrote me on March 1 from Lavaca County as follows:

Up to a severe freeze of two weeks ago (February 16-17) I could at any time find some—not many—in my neighbors' fields apparently feeding on buds or small leaves at the base of the stalk, which had never been entirely frozen.

However, he did not find many on his own cotton until April, when he picked some from trap rows which were planted on March 13. In 1904 he noticed the first weevils about the middle of March, but, as in previous years in other localities in southern Texas, we have records of their feeding on shoots from stumpage cotton much earlier than this. In general, it seems that when the normal mean temperature

^a Bul. 45, Div. Ent., U. S. Dept. Agric., p. 82.

passes 68° F. the first weevils commence to emerge from hibernation, and this conclusion is confirmed by all of our observations.

It will be seen from the temperature curves in figure 2 that at Victoria the normal mean temperature usually reaches 68° about April 1 and at College about April 15. Figure 2 shows that in 1903 the mean average temperature reached 68° about one week later at Victoria. In 1904 (fig. 2) the mean temperature reached 68° about March 10 at Victoria and the first weevils were found about the middle of March, which is also true of Lavaca County, while at College Station 68° was reached a week later than usual, but the temperature was above 66° for the month preceding April 15. If the mean rise in temperature from February 15 to May 15 be plotted, the line would reach 68° about April 5, which very closely approximates the date of the first

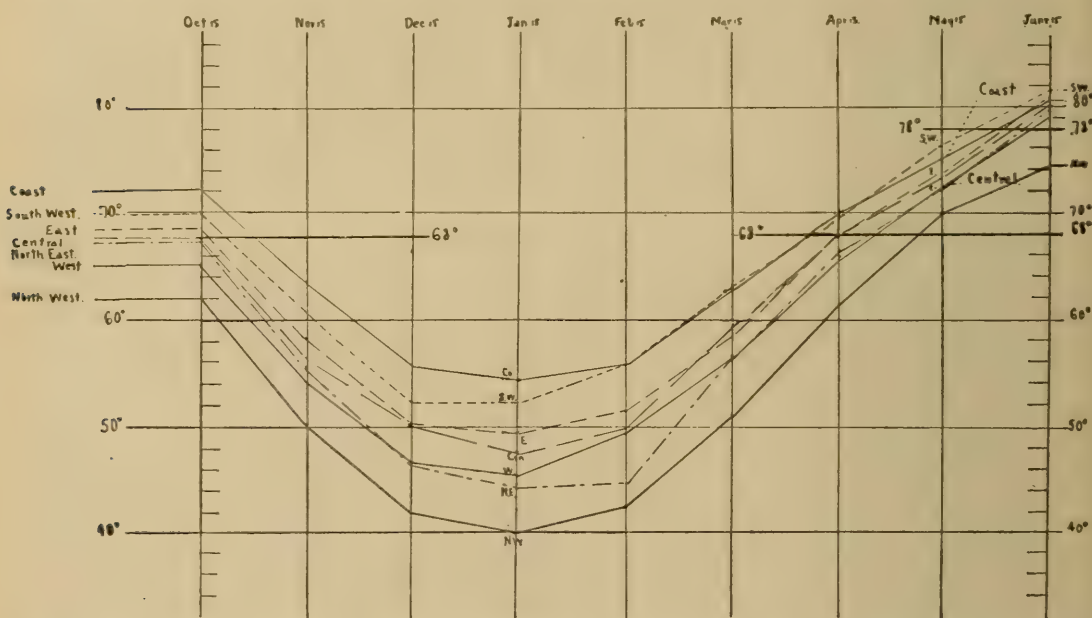


FIG. 6.—Comparison of normal temperatures, October 15 to June 15, for various districts in Texas.

appearance of the weevils at College Station for that year. From all the data available, therefore, it seems very safe to assert that when the temperature reaches 68° or has been above 65° for several weeks the first weevils will emerge. By consulting figure 6 this time may be seen for any section of the State. The curve shows that weevils would normally emerge from hibernation about 10 days earlier in the southwestern and coast countries than in central and northeastern Texas, and about 20 days earlier than in northwestern or western Texas.

The greatest number of weevils emerge considerably later and usually about the time cotton commences to square. The time of the principal emergence and the beginning of general oviposition by the hibernating brood is practically the same. A few belated weevils appear after this time, as is shown by the field records of Mr. Telt-schick for 1903 and 1904. For if the bulk of the weevils emerges at the

time the cotton commences to square freely and frequent counts be made, the number will be found to decrease for a few days, and there is then a sudden rise due to the maturing of the first brood early in June, and it is practically impossible to determine in the field whether any hibernated weevils subsequently emerge. However, in 1904, it is certain that no weevils emerged later than June 29, for at that date practically no weevils could be found in the field, tho the bulk of the hibernating weevils appeared from June 5 to June 10. Consequently this year (1904) certainly no weevils emerged later than 22 days after the maximum number.

It has previously been shown by Professor Mally (l. c., p. 16) and by Hunter and Hinds, and noted above, that the weevils emerge gradually over a period of from 4 to 6 weeks, normally more nearly the latter time. This range covers practically the same length of time as from planting to the formation of the first squares on the bulk of the cotton in any given community. The gradual emergence from hibernation is shown by the number of weevils to 100 stalks in Table III for 1904 at College Station. In 1903 Mr. Teltschick picked the weevils from three-fourths of an acre of trap rows, planted March 13, on which the first bloom appeared May 28, and secured weevils as follows:

April, about 40 weevils.

May 4, 36 weevils picked in 1 hour's time.

May 11, 43 weevils picked in 1 hour's time.

May 18, 68 weevils picked in 2 hours' time.

May 25, 54 weevils picked in 4 hours' time.

In 1904 Mr. Teltschick made observations especially to determine this point. His notes are as follows:

Two plats of one-fourth of an acre each were selected in that part of the field which was farthest away from my own as also from any other cotton patch. The two plats themselves were separated by 25 rows of corn and surrounded by sugar cane on two sides and by timbered land on the other two. No cotton had been grown on or near these plats in 3 years. Plat 1 was planted in King cotton March 4, was up to a good stand March 14, and chopped to a stand April 11. From plat 1 the weevils were picked as follows:

April 1, 14 weevils.

April 11, 27 weevils.

April 21, 26 weevils.

May 2, 96 weevils.

May 12, 140 weevils.

May 23, 150 weevils.^a

Plat 2 was planted in Shine cotton April 25 (7 weeks later than plat 1), was up to a good stand April 30, and was chopped to a stand May 12 (one month later than plat 1). On plat 1 the first squares appeared May 2 and on plat 2 May 28. All fallen and flared squares were picked up on both plats at intervals of 8 days up to July 1. From plat 2 there were picked, on May 12, 3 weevils; May 23, 35 weevils.

These records show very clearly the gradual emergence of the weevils from winter quarters. In 1903 the maximum number of weevils

^aWeevils were picked also during June, but these doubtless belonged to the first summer brood.

appeared on May 18, in 1904 on May 23, and in 1901 on May 10-15; but as the intervals between pickings were a week or 10 days it would seem safe to judge that the normal time for the maximum number to emerge at Vienna is about May 15 to 20. It will also be noticed that the weevils appear much more rapidly and early on early planted cotton, but the maximum number does not appear at the time of squaring of the earliest planted cotton, but at about the time of squaring of the main crop, thus giving a decided advantage to the early planted cotton. The determination of the exact time of the emergence of the maximum number of weevils will be practically the same as that for the time of maximum oviposition for the hibernating brood, concerning which see page 25, and which in Lavaca County will normally occur about May 20, at College Station about June 1, and in northern Texas probably about June 10.

PREVENTION OF HIBERNATION.

It may be readily seen from the foregoing discussion that any methods which will reduce the number of weevils going into hibernation in the fall are of the utmost importance in the control of the pest, inasmuch as nature aids in further reducing their numbers during the winter. All students of the problem of boll-weevil control have agreed that in this prevention of successful hibernation lies the most effectual means of reducing the numbers of the weevil and preventing injury the next season. Two methods are advocated: (1) The destruction of the stalks in the fall as long before frost as possible, and (2) rotation of the cotton crop, planting on land not in cotton the previous year and as far from such land as is possible.

FALL DESTRUCTION OF STALKS.

By the destruction of the stalks as early as possible in the fall the number of weevils entering hibernation is reduced in several ways: (1) All immature stages in the squares and bolls, which might develop into weevils if the stalks remained standing, will be destroyed. (2) Probably three-fourths of the adult weevils in the field at the time of burning may be destroyed if the work be properly managed. (3) By clearing the field of cotton some time before the normal time when weevils will enter hibernation their food is destroyed and the adults either starve or migrate to other fields. Were this work done uniformly over a considerable area, the weevils would surely starve, as they can not be forced into hibernation before the normal time. That a large mortality follows if this is attempted is shown in our records (see pages 2-3). These advantages are apparent, tho but few actual records of the benefit of such fall destruction of stalks have been published. From the conditions under which experiments must be made it is difficult to demonstrate in a tangible way the actual

benefit to be thus derived, but in the case of plats burned over in the fall of 1903 we found there were far fewer weevils in 1904 than in fields where the stalks had been left.

On October 23 and 25 the stalks on our experimental plats, covering about 30 acres, were cut with a single cutter made of a V-shaped sled, with knives projecting out and backward on either side about a foot beyond the rows. A team draws the cutter with a man on it, cutting 2 rows at once and about 15 acres per day. The stalks were then raked and piled, and were dry enough to burn in a week. On one-half the field 2 rows in every 20 were left standing as trap rows. No weevils were found later on the dried piles, but they had assembled in large numbers on the standing trap rows. Thirty-six were found on four plants. These trap rows were then cut, left over night on the ground, raked the next morning, and placed on the dried piles. That afternoon examination by the writer showed that on the green stalks on the dried piles there was an average of 1 weevil to every square and boll, often 5 or 6 being found on a square. The torch was then applied and the piles quickly burned. After this many weevils were found on the shoots growing out from the stumpage and an occasional stalk that was left. (This might be obviated more completely by plowing out the stalks.) A herd of cattle was therefore turned into the field and all herbage was devoured in a very few days. A better destruction could hardly be desired, and but little extra labor and expense was involved.

At the apiary a small plat containing two-thirds of an acre was left with the stalks standing all winter. This plat was surrounded by a grove and was half a mile from other cotton.

Observations by the writer show that in 1904 upon the 30 acres upon which the stalks were burned there appeared of the hibernated brood during the spring but 1.2 weevils to 100 stalks, while on the apiary plat where the stalks had been left there were about 4 weevils to 100 stalks, or over three times as many hibernated successfully where stalks remained standing as where they were destroyed.

Again, on July 13 the field where stalks were burned averaged 3.3 weevils to 100 stalks, while fields of Messrs. Boyett and Gray, just over the railroad, not 100 yards distant, where the stalks had not been burned, tho other conditions were practically similar, had 6 and 12 weevils to 100 stalks, respectively, or an average of three times as many weevils as on the field where stalks were burned.

Were all conditions exactly the same, as regards culture, land, etc., and were it possible to prevent the migration of the weevils from neighboring fields to those where the stalks had been burned, the latter would undoubtedly show a much greater yield at the end of the season, but as it is very rarely possible to eliminate these factors the

above records show in a striking way, based upon extensive counts, the difference in amount of infestation during early summer where stalks have been destroyed the previous fall.

CROP ROTATION.

The value of the rotation of crops was strikingly shown by the difference between the number of weevils occurring on the experiment station variety plats at the college barn, where cotton had been planted the previous year (1902), with corn adjoining, and our plats, situated a mile distant on land which had never been in cotton, having grown sorghum in 1902, tho cotton was grown not 100 yards distant. The cotton was planted April 5 at the college barn, and on June 17 there were 5 weevils to 100 stalks, 2 being found on the 40 stalks examined, whereas on the other field there were but 0.5 to 100 stalks, only 5 being found on 940 stalks examined. Again, on August 13 the varieties at the barn, planted May 3, had 233 weevils to 100 stalks, 163 being found on 70 stalks, while only 5.5 to 100 stalks occurred in the field where there had been no cotton the previous year, only 10 being found on 180 stalks from all parts of the field. On the same day 48 weevils to 100 stalks were found on Mr. James Boyett's cotton, just across the railroad from our field, his land having been in cotton the previous year, while on Mr. Suber's cotton, a mile distant, 53 to 60 per 100 stalks were found, this crop also following cotton.^a

WHERE THE WEEVILS FIRST APPEAR.

It has been frequently observed in all parts of the State that the weevils first appear on the cotton field along the side adjoining woodland, if there be any timber adjoining. From the extensive reports of observers thruout the State there seems to be no doubt that cotton in timbered sections is much more seriously injured by the weevil than that on prairie land, owing to the more successful hibernation in the timber. It has also been observed by many that the weevils first appear and commence to be injurious in that part of the field where they were most abundant during the previous year. In southern Texas the weevils may be found on stubble cotton very early in the season; in fact practically all winter. They hardly seem to hibernate in the strict sense of the word, as under such conditions they are found feeding on warm days practically thruout the winter.

Upon emerging from hibernation the majority of the early weevils seek the earliest cotton, which may be either stubble cotton or planted, and they will be found more abundantly upon it than elsewhere, even tho the early cotton forms but a very small part of the acreage on a

^a The same value of rotation has been noted by Mr. Louis Teltschick at Vienna. (See Mally, Report on Boll Weevil, 1902, p. 66, paragraph 4.)

large plantation, and altho later cotton may be up, but still small. Having assembled upon the early cotton, most of these weevils seem to stay upon it until it squares, and they do not spread generally to the later cotton until it also commences to square. This habit must be taken into consideration in estimating the number of weevils upon a given area in the spring, for if the cotton be not planted at the same time over the entire place, neither the earliest cotton nor that planted later will give a fair idea of the number of weevils which have hibernated successfully. The total area must be taken into consideration and the average for the whole place estimated by duly weighting the number found upon the acreage of both early and late planting. By the time the majority of hibernated weevils emerge, however, the medium and late-planted cotton will be so far advanced as to hold the weevils near where they emerge, and no further concentration may be expected.

SUMMER BROODS OF THE WEEVIL.

The first summer brood of weevils from eggs deposited by the hibernated adults begins to emerge from squares during the last ten days in May in southern Texas, and farther north, in central and northern Texas, continues emerging during June and the first ten days in July. Thus in Lavaca County there is a marked increase in the number of weevils found in the field after June 1 or sometimes during the last week of May. In 1901 Mr. Teltschick secured 2,136 weevils up to the third week of May on 10 acres, the maximum appearing during the second week of May; but during the last week of May he secured on the same area 2,114 weevils, or very nearly as many as during the whole spring, showing that the first new brood was then emerging. In 1903, up to June 1, on three-fourths of an acre of trap rows he had picked 241, with a maximum on May 18; but on June 1 he secured 368, and during the month of June 1,759, with the maximum number on the 15th. In 1904, on the one-fourth-acre plot previously mentioned he secured 453 up to June 1, the maximum number of 150 on May 23; but on June 4 250 were secured and 146 on June 18. Mr. Teltschick writes as follows:

In my opinion very few weevils, if any, matured from punctured squares before June either in this or previous years in this section. Cotton planted here March 1 (this is as early as any is planted, the greater bulk never being planted before April 1) as a rule begins to form squares on April 25. It requires the squares at that time from two to three weeks to grow large enough to provide the food necessary for the development of the weevil. The squares are, of course, being punctured as soon as they form, and I doubt whether any eggs are deposited in them so long as they are too small to permit the weevil secreting itself within the involucre.

At College Station the first fallen squares were found on June 17, 1904. The first weevils from these squares emerged June 23 and the

last on June 29. At Terrell, Tex., the first brood commenced to emerge on June 30 and the last of these was secured on July 12.

Altho the hibernating weevils may continue to oviposit for some time there seems to be but little overlapping in the appearance of the first and second generations of weevils. There is a period from the first to the middle of July thruout the greater part of the infested area when but little damage is reported from the weevil and when but few weevils are found. This is the period during which the second brood is developing within the squares. About the middle of July and during the next ten days the second brood of weevils appears and is generally reported. In some instances the injury by the second brood is serious, especially where large numbers have hibernated successfully, and after the second brood appears practically all the squares become punctured and no more cotton is made. This condition is more common in southern Texas, but usually the injury by the second brood is no more serious than that due to the first in late June, and in a great many cases it is reported as being decidedly less. In general, unless there be exceptional rains, the hot suns of July seem to check the development and injury of the weevil.

The distinction between the second and third broods is not so marked. The period of oviposition of the second brood doubtless being longer than that of the first, the third brood commences to appear before the last of the second brood has emerged. However, there is still a very decided and notable increase in the number of weevils from the first to the middle of August, depending upon the latitude and season. This is generally noticed, and commonly reported as the third brood. Usually with the emergence of this brood the weevils have become sufficiently numerous to destroy all the squares as they form so that no more blooms are seen. From this time the weevils attack the maturing bolls much more frequently. After the appearance of the third brood the different generations become so involved that it is impossible to distinguish between them.

At Terrell, Tex., five distinct broods were reared in 1904 up to October 3, and these weevils then commenced to oviposit, so that there would doubtless have been a maximum of six complete broods in that locality. The records at Terrell are as follows: From the first fallen squares injured by the hibernated brood, weevils emerged on June 30, July 5, and July 12. On July 5 these weevils were placed in a cage upon fresh squares, and the weevils developing from these squares emerged on July 22, or in from 17 to 22 days. These were placed on squares on July 23, and the weevils from them, or the third brood, emerged August 17 to 20, or in 25 to 28 days. These weevils were placed on squares August 20, and the weevils developing from them, or the fourth brood, emerged September 8 and 9, or in 19 to 20 days. These were placed on squares September 10, and the weevils

developing from them, or the fifth brood, emerged October 3, or in 23 days. In all cases this period of development includes to a greater or less extent the feeding period, which must precede oviposition.

Practically the same number of generations seems to occur at College Station. Altho we have not determined this by rearing weevils as rapidly as possible thruout the season, the field records show the first three broods very distinctly, and during the fall there seem to be three more broods between September 1 and the time of hibernation. The number of broods after September 1 is very largely controlled by the temperature and rainfall, which combine to affect the food supply and the mortality of the developing weevils. It is probable, however, that in a late season seven broods might develop at College Station, as the field records (see page 10, Table II, for 1903) show the weevils (probably of the sixth maximum brood) to have been freely ovipositing early in November, and if frosts did not occur until late in that month a large number of these would probably emerge.

In southern Texas, Hunter and Hinds have shown that with the average season of reproductive activity, extending from May 1 to November 15, eight generations may be produced during the year. Thus there is probably a difference of two broods in the maximum number of generations between southern Texas and northern Texas, but this difference will not materially affect either the injury by the weevil or the number of weevils going into hibernation, as the weevils seem to reproduce in practically the same length of time in northern Texas as in southern Texas, the summer temperature being nearly the same, and after the third brood they are sufficiently numerous in either section to prevent the further fruiting of the crop. Nevertheless, factors aside from a difference in the number of generations will probably cause less damage in northern Texas.

By September 1 to 15 the weevils usually reach the maximum number and during the fall, as before observed, their number depends primarily on the food supply and weather conditions, so that the number going into hibernation depends on local conditions. The difference in the amount of injury which the weevil may do in central or northern and in southern Texas will depend therefore, first, upon the smaller number of weevils hibernating successfully and, second, upon their appearing later in the spring so that the cotton may be able to make a more rapid growth in comparison with the development of the early broods of the weevil under the high temperatures prevailing during early summer in northern Texas than will be the case farther south in late May. But it is not probable that the mere number of broods will make any material difference in the amount of injury. The first three broods seem to be well defined, as is clearly shown by the numerous reports of our voluntary observers and by the reports of the observers of the crop service of the U. S. Weather Bureau. The amount of

injury done depends upon the abundance of these broods, which depends largely upon the time of appearance and also upon the relative abundance of the hibernating brood. .

MORTALITY OF SUMMER BROODS.

The mortality occurring in summer and fall broods may properly be distinguished from that among weevils which hibernate, for in the summer the greatest mortality occurs in the immature stages. The number of weevils developing from squares in which eggs have been laid is shown in Table IV.

TABLE IV.—*Percentage of weevils from infested squares.*

Lot.	Date.	Where picked and how kept.	Number of squares.	Per cent emerged.	Weighted per cent emerged.
1	May —, 1902	Picked from ground; placed in cloth bags and kept in laboratory under dry conditions	11,250	23.5	23.5
2	July 8, 1904	Picked from ground; kept under fairly normal conditions	1,522	39	.....
3	Sept. 10, 1903	do	675	30	.....
4	Sept. —, 1903	do	350	34	.....
5	Sept. 21, 1903	do	377	23	.....
Total of lots 2, 3, 4, and 5			2,924	.....	34.3
Total of lots 1, 2, 3, 4, and 5			14,174	.....	25.7
6	Sept. —, 1903	Picked from plants; ^a kept on moist soil	162	40	40
7	Sept. 21, 1903	Picked from ground; kept between shaded rows	200	39.5	.....
8	do	do	43	30	.....
Total of lots 7 and 8			243	.....	37.8
Total of lots 6, 7, and 8			405	.....	38.7
9	July 15, 1904	Picked from ground, under screen; placed in part sun	400	9.0	9.0
10	Sept. 11, 1903	Picked from ground; placed in sun	210	2.3	.....
11	Sept. 22, 1903	Picked from plants; ^a placed in sun	68	2.9	.....
12	Sept. 11, 1903	Picked from ground; placed in sun	354	0	.....
13	Sept. 21, 1903	Picked from plants; ^a placed in sun	91	1.1	1.1
Total of lots 9, 10, 11, 12, 13			1,123	.....	3.9

^a Picked from plants when squares would drop off by touching them.

Lot 1 is based upon the following note made by Mr. Wilmon Newell. During May, 1902, Professor Mally gathered infested squares in fields along the Brazos River below Wellborn. About 1½ bushels of these squares were brought to College Station, sewn up in cheese-cloth sacks, and weevils allowed to hatch. June 15 the weevils were picked out and by careful measurement there were 115 c. c. of them, and 15 c. c. contained 345 weevils, or 1,763 weevils to a bushel. Subsequently we have found about 7,500 squares in a bushel, thus indicating that only about 23.5 per cent produced weevils. The squares were kept in the laboratory in a dry place, and the lack of moisture may probably account for the low percentage producing adults. In another test 2,924 squares gave a weighted average of 34 per cent producing weevils. These were picked up and kept under fairly normal condi-

tions. From 405 squares which were kept on moist soil or between shaded rows weevils were developed from 38.6 per cent, but where the squares were left in the hot sun, among 1,123 squares but 1 per cent produced weevils. This shows strikingly the value of having rows wide apart so that the sun may strike the fallen squares.

TABLE V.—Percentage of mortality of weevils at different stages of development.

Lot.	Date.	Picked from—	Condition.	Number of squares.	Dead.					Alive.				Weevils emerged.	Possible to emerge.	Remarks.
					Squares dry.	Larvæ.	Pupæ.	Weevils.	Total.	Larvæ.	Pupæ.	Weevils.	Total.			
1	Aug. 12	Ground.	.....	133	36.3	1.5	2.2	.....	28	4	.....	24	56			Counted just from field.
2	July 14	do....	.....	572	44	2	3	.....	23	11	.....	17	51			Do.
3	1904. July 8	do....	.....	1,522	57.6	.....	3.4	.....	.....	.....	.....	39	39			Allowed to emerge.
4	Sept. 11	do....	In shaded rows.	200	60	0.5	.....	.....	.....	.....	.....	39.5	39.5			Do.
5	Sept. 22	do....	do....	43	69	.....	.....	.....	.....	7	2	.....	21	30		Partly allowed to emerge.
6	Sept. 21	do....	In sun....	210	64	32	1	.....	0.6	1.4	.....	0.5	2.5			Do.
7	do....	do....	do....	68	92.8	.....	.....	.....	1.4	4.4	.....	1.4	7.2			Do.
8	do....	do....	Squares brown.	100	61	18	3	2	1	3	1	10	15			Counted just from field.
9	do....	do....	Squares green.	268	65	5.6	1.5	0.7	11	9	1.8	21.8	4.8	26.6		Do.
10	Sept. 11	Plants	do. ^a ..	400	59.5	1.8	0.5	6.8	1	.....	.....	30.5	31.5			Allowed to emerge.
Lots 6-10, weighted average...				1,046	63	10	1	3	77	5.4	3.1	0.5	9	14.8	.....	Sevendied in emerging.
Average of squares in which some stage is found.				.....	.....	26	3	8	37	14	10	1	25	39	.....	
11	1904. Oct. 5	Plants ^a .	Squares green.	100	44	.....	.....	.....	44	55	1	56	0	.....		Counted just from field.

^aSquares picked from plants when just ready to drop.

The count made on October 5, 1904, fully confirms this. These squares were picked from the plants, taking those that would drop into the hand when touched, as in previous similar work. An immediate examination showed that 55 per cent contained live larvæ of various sizes, but mostly about half grown. Tho a few were ready to pupate, but one pupa was found, while there were 44 in which the work of young larvæ was clearly recognizable but in which no larva could be found. All squares showed egg punctures, but no eggs could be found in them.

The time at which the greatest mortality in the development of the weevil occurs is a matter of some practical importance and the data given in Table V throw considerable light upon this point. We have but few observations as to the mortality in the egg stage, but Hunter and Hinds state that but few eggs fail to hatch, which we have found to be the case in the laboratory. As the square receiving an egg does

not fall for about 10 days and remains green long after the hatching of the egg, which takes place in about 2.5 days, there seems no reason to suspect any considerable mortality at this period. After the infested squares have dried or decayed it becomes very difficult to find any trace of larvæ which die before they are half or two-thirds grown. The table shows that in about 63 per cent of the infested squares no trace of weevil stage could be found. In this percentage are the squares which had received feeding punctures only and a large number showing external signs of egg punctures, thus indicating that a great mortality occurs while the larvæ are less than half grown. Furthermore, it will be observed that of those individuals which pass the larval stage successfully 1.6 per cent died in the squares or while emerging. It has previously been shown that only about 1 per cent of squares placed where fully exposed to sunshine developed weevils. It would therefore appear that the mortality was largely due to the squares becoming so dried that the food supply was cut off from the young larva. Hence, it would seem that the sooner the square falls after being punctured, the higher will be the mortality, provided the ground is not shaded by close rows, and that any means for knocking off the squares before they would naturally fall, or a variety or strain of cotton which sheds its squares more quickly after being punctured, will be of decided advantage in increasing the mortality of the weevil. This seems to be even more marked where the squares are covered by the soil as is shown in Table VI.

TABLE VI.—*Percentage of mortality of weevils in squares buried in soil.*

Lot.	Date.	Depth buried.	Condition.	Number of squares.	Per cent dead.					Per cent alive.			Per cent emerged.		
					Squares dry or decayed.	Larvæ.	Pupæ.	Weevils in square.	Weevils in soil.	Total.	Larvæ.	Pupæ.	Weevils in squares.	From squares.	From soil.
1	Aug. 15	$\frac{1}{2}$ inch	Kept moist in laboratory.	a 25										40	
2	do	1 inch	do	a 25										46	
3	do	$1\frac{1}{2}$ inches	do	a 25										32	
4	Aug. 29	1 inch	do	a 25	72	4			4					24	20
5	do	$1\frac{1}{2}$ inches	do	a 25	28		4		12	44				38	16
6	Sept. 21	$1\frac{1}{2}$ inches	In field	50	74	2				76	8			8	
7	do	$2\frac{1}{2}$ inches	Rather dry	78	75		4	9		b 88	4		1	6	
8	Sept. 11	4 inches	do	200						c 100				0	0
A	do	On surface	In sun	180	85	15								0	0
B	Sept. 18	do	do	174	62	26	12							0	0
C	July 15, 1904	do	Under screen	400	91									9	
9	do	1 inch	Rather wet	400	94.5				3					25	
10	do	2 inches	do	400	81				10					9	
11	do	3 inches	do	400	92.5				5					2.5	
12	do	4 inches	do	400	95				3	0.5				1.5	

a Contained larvæ or pupæ when buried.

b Dead weevils eaten by ants; squares green.

c Ants' nest just beneath.

It is frequently asserted that frequent cultivation is of value against the weevil in that the immature stages are killed by covering the squares with soil. The data given in Table VI hardly confirm this. Rarely will squares be buried over 1 or 2 inches. Lots 1, 2, 3, 4, 5, 9, and 10 show that the mortality in squares buried at this depth is about the same as under normal conditions. Lots 6 and 7 seem to show a benefit from burial, but these were placed in rather dry soil in the field in open sun, and when compared with lots A and B on the surface it is seen that the burying insured a greater per cent developing. It seems safe to say that in no case will burial for not over 2 inches result in any great mortality, and that in all probability the percentage of weevils developing will be greater than if left exposed to the sun on the surface. It is more frequently claimed that by plowing squares under deeply after a good rain the moist soil will rot them and the weevils will be unable to escape. Unfortunately we have no conclusive tests upon this point, but it would seem that a sufficiently deep plowing to bury squares 4 inches just after a rain would be such a decidedly bad agricultural practise as to possibly offset any benefit that might be derived from destroying the weevils in the squares buried.

RATE OF INCREASE OF THE WEEVIL.

Hunter and Hinds have shown that a female weevil normally lays some 150 eggs during an average of about 54 days, and that nearly one-half of the eggs are deposited during the first third of the period of oviposition. Allowing 24 days for the development of the average adult and 18 days for the oviposition of one-half of the eggs, they also estimate that the average length of a generation is about 42 days. The sexes of the weevil are produced in about equal numbers. With these factors as a basis we may easily compute that if on June 1 there were an average of 2 weevils to 100 stalks of cotton, on July 15, at the end of the first theoretical brood, there would be 50 weevils; and that, if one-half of these were females and the usual percentage survived, on September 1 there would be 1,250 weevils to 100 stalks. But these computations make no allowance for the mortality in the immature stages, and extended observations in the field show that such rapid multiplication does not really occur. It has been ascertained by the writer that the first brood of weevils rarely numbers more than five times the hibernated brood, and at College Station often but two or three times. At Vienna, in 1903, Mr. Teltschick picked 241 weevils from his trap rows up to June 1, while on June 1 to 7, 15, and 22 he picked 759 weevils on the same area. This doubtless represents very accurately the increase of the first brood over the hibernated weevils, showing an increase of 315 per cent. It is of course probable that some weevils had left the trap rows for the planted cotton, which was barely commencing to square

on June 22, but the number would have been comparatively small and the end of the generation was probably considerably later, so that an increase of ten times, or 1,000 per cent, would be a conservative estimate. The largest number of weevils at College Station early in July was found on Eckol's cotton, which was planted very early, on July 14, 1904, when there were 27 weevils to 100 stalks. This field was adjoining a gin and 1 mile away, on Ayer's cotton, there were but 15 weevils to 100 stalks. On the same date, on the Brazos River, there were but 10 weevils to 100 stalks, and on our experimental plats, where the stalks were destroyed the previous fall, the hibernated brood had numbered barely 1 weevil to 100 stalks. There were but 3.3 weevils of the first brood to 100 stalks. Accurate figures for the rate of increase from the first to the second brood are not available, but from general observations and from reports of the injury done by the second brood, as compared with the first, it is safe to assert that the rate of increase is not materially greater for the second brood than for the first. The rate of increase of the third brood seems to be decidedly greater, but, as the late-developing individuals of the second brood and the first of the third brood more or less overlap, it is difficult to determine this accurately in the field. However, the total increase at the appearance of the third brood over the number of hibernated individuals can be given in one or two cases. Along the Brazos River, in 1903, there were but 2 weevils to 100 stalks on June 17, and on August 25 47 weevils to 100 stalks, or an increase of twenty-three times between these dates, the collection at the latter date probably representing part of the fourth brood. In 1903, at the college on our experimental plats, there were 5.5 weevils to 100 stalks on August 13 where there were 1.5 on June 18, representing the hibernated brood. The greatest increase we have observed from the hibernated brood until the middle of August was on the plat of the experiment station at the college barn in 1903, where there were 5 hibernated weevils to 100 stalks on June 18 and 233 on August 13, or an increase of forty-seven times. From a careful study of the data it seems safe to assert that the usual rate of increase from the second to the third brood is not over ten or fifteen times in this section, as there is usually not over 1 weevil to the stalk of cotton until after mid-August. It will be seen, therefore, that tho the theoretical increase of the weevil, based upon a careful study of its habits and the mortality as far as can be ascertained, would show an increase of twenty-five times from between the first and second and second and third theoretical broods of 42 days each from June 1 to September 1, as a matter of fact, during the first period mentioned, the increase up to and including the second brood, emerging about the third week in July, is usually considerably less than twenty-five times the hibernated brood—probably not over fifteen times—and that the total increase

from the 1st of June to the 1st of September is only about fifty times, certainly not over sixty-five times, where theoretically it would be six hundred and twenty-five times. The reason for this discrepancy is unknown to the writer, but is a fact for which the cotton planter should be decidedly thankful. It may be that the mortality of the immature stages of the weevil in the squares is greater than the count of thousands of squares has shown, that many of the adult weevils die or are destroyed before reproducing, or that the number of eggs laid and the length of the period of oviposition in the field are much less than those observed in the laboratory. That this is true of the hibernated brood is shown on page 12. It would seem that the discrepancy is mostly due to the two latter factors. This discrepancy but emphasizes the necessity for accurately observing the field conditions on a very large scale in different fields in different sections of the State constantly thruout the season if we are to obtain accurate knowledge of the true habits, rate of increase, and injury of the boll weevil, as it occurs in the field.

To summarize briefly, it would seem that if there be 2 weevils to 100 stalks of the hibernated brood, then by early in August there will be a sufficient number of weevils to stop the blooming of the cotton. Furthermore, with the normal increase it seems that in about a month after 4 or 5 weevils are found on 100 stalks, there will have been sufficient increase to prevent further fruiting of the cotton, and there will then be from 75 to 100 weevils to 100 stalks. The utter impossibility of making a cotton crop where a large percentage of the weevils survive the winter will therefore readily be seen unless exceptional measures can be taken to check their multiplication. Weather conditions unfavorable to the development of the weevils are decidedly the most important controlling factors, and that such conditions not infrequently occur is shown by the reports of voluntary observers in southern Texas in 1904.

INJURY TO SQUARES IN RELATION TO THE NATURAL INCREASE OF SQUARES.

The formation of squares upon the cotton plant depends upon so many different factors that it is exceedingly difficult to make any general statements regarding the increase in their numbers. Thus the character of the soil, the nature of the variety of cotton, and the climatic conditions prevailing all influence the formation of squares. It may be clearly seen from Tables VII to X that some varieties form squares much faster than do others, and that between the same dates the same variety will not produce the same number of squares in different places. However, from an examination of the tables we may form some idea of the natural increase of the squares early in the season during the critical period of fruit formation. During the 2

weeks following the formation of the first 2 squares the number of squares will increase ten or twelve times; in other words, there will be from 20 to 25 squares; and during the next 2 weeks this number will increase two times, or at the end of the month there will be about 40 squares, or about twenty times as many as at the beginning of the month, when there were but 2 squares. At the end of the second month there will be an increase of about two times over the first month, or there will be approximately 100 squares to the plant. During the first third of the third month the number of squares usually remains about constant, but after that, tho squares are constantly forming, there is a tendency to decrease for a time.

TABLE VII.—*Progress of infestation by boll weevil and production of fruit upon cotton plats at College Station, Tex., in 1903.*

Variety.	Date of examination.	Squares.					Blooms.		Bolls.			Wee- vils.	Yield per acre.								
		Number of stalks.	Total per plant.	Total punctured.	Per cent punc- tured.	Dropped.	Total.	Per plant.	Perfect.	Open.	Total per plant.		Punctured.	Total.	Per 100 stalks.	Pounds of seed cotton.					
																Date.	First picking.	Date.	Second picking.	Total.	Bales.
Jones Im- proved	June 18 20 $\frac{1}{2}$																				
	July 11 25 9		2	0.9		8	0.3	1													
	July 27 30 51		11	7		37	1.2	138		4.6											
	Aug. 12 10 21		19	9.1		70	31	126		12											
	Sept. 5 5 34		90	56		127		0	25	6 6		7 1	20	Sept. 17	104	Oct. 20	98	202			
Allen	June 18 20 1.5																				
	July 11 25 9					23	1	12		5											
	Aug. 12 10 35.2		125	35		50	38	3.8	208	24	30			Sept. 17	178	Oct. 20	80	258			
Excelsior	June 18 20 1.8																				
	July 11 25 8.3		1	.4		11	.5	10		4											
	Aug. 12 10 44.7		59	13		42	31	3	119	12	6										
	Sept. 5 5 20.5		132	64		110			4	8 6	20	4	80	Sept. 16	172	Oct. 20	92	264			
Parker	June 18 20 1.9																				
	July 11 25 11					11	.5	11		5											
	Aug. 12 10 36.8		55	15		97	47	4.7	211	22	6			Sept. 16	184	Oct. 20	60	244			
Griffith	June 18 20 1.5		2	6.3								2	10								
	July 11 25 9		14	6		13	.5	6		24											
	Aug. 12 10 28.9		62	21		74	31	3	69	8.5	16	3	30	Sept. 17	136	(?)	(?)	(?)			
King	June 18 20 2.5																				
	July 11 25 12		1			13	.5	24		1											
	July 27 50 72.6		31	.8		612	7	2.5	486	9											
	Aug. 12 10 47.5		57	12		97	51	5	233	23	6	3	30								
	Sept 5 5 57		144	51		160			20	40 17	25	11	220	Sept. 16	290	Oct. 20	68	358			

TABLE VIII.—Comparison of progress of infestation by boll weevil and production of fruit upon variety plats on Carson & Smith's plantation, Brazos River, Wellborn, Tex., in 1903.

Plat.	Variety.	Date of examination.	Number of stalks examined.	Squares per plant.				Bolls.			Weevils per 100 stalks.	Yield per acre.			
				Number.	Punctured.	Per cent punctured.	Blooms per plant.	Per plant.	Per cent punctured.	Pounds seed cotton.					
										First picking, September 23.		Second picking, October 27.	Total.	Bales.	
1.	Native	June 26. July 17. Aug. 17. Aug. 25.	100 50 10 5	1.6 12.0 65.0 70.0	0.01 .04 3.5 36.0	0.6 .3 5.3 51.4	0.14 0.3 1.9 2.6	0.06 0.0 16.9 21.2	0.0 0.0 0.0 9.4	20	270	172	442	.27	
2.	Territory	June 26. July 17. Aug. 25.	100 50 5	1.0 8.0 99.0	0 .04 33.8	0 .4 34.1	0 .08 3.0	0 .3 21.0	0 .0 11.0		163	121	284	.17	
3.	Dickson	June 26. July 20. Aug. 17. Aug. 25.	100 50 10 5	.75 28.0 98.0 92.0	0 .08 7.8 39.6	0 .3 7.9 43.0	0 .48 3.2 2.0	0 .92 23.9 26.6	2.1 .4 0.0	40					
4.	Schley	June 26. July 20. Aug. 17. Aug. 25.	100 25 10 5	.32 20.0 70.0 94.0	0 .08 4.5 41.6	0 .4 6.4 44.4	0 .2 2.4 3.0	0 .4 8.3 15.0	0 .0 0.0 0.0	60					
5.	Bohemian	June 26. July 20. Aug. 17. Aug. 25.	100 25 10 5	.73 16.0 80.0 144.0	0 .04 7.0 81.0	0 .2 8.7 56.2	0 .16 2.1 2.0	0 .2 15.4 27.8	0 .0 0.0 14.7	80			a 340	.21	
3, 4, 5, 7.	King	June 26. July 20. Aug. 25.	100 25 5	2.5 58.0 104.0	.03 .16 40.2	1.1 .3 38.6	1.52 2.44 2.0	0 .0 42.0	0 .0 0.0	80	b 509	491	b 1,000	.65	
8.	Shine	June 26	100	2.96	0	0.0									
9.	do.	do	100	3.28	0	0.0									
8-9.	do.	July 20	25	65.0	0.36	.5	1.40	3.6	.0						
8.	do.	Aug. 25	5	90.0	37.4	41.5	3.8	52.0	.04	40					
8-9.	do.	do									476	1,471	1,948	1.21	
10.	Shine	June 26	150	3.3											
11.	do.	do	150	1.6											
12.	do.	do	150	2.2	0	0.0									
13.	do.	July 17	50	54.0	.3	.5	.64	1.58							
12-13.	do.	June 26	150	2.9	.01	.45									
10-13.	do.	July 17	50	61.0	.08	.1	1.2	1.96							
14.	do.	Aug. 17	10	109.0	6.8	6.2	2.6	32.3	.02	10			a 1,000	.65	
15.	do.	June 26	100	4.7	1.0	2.1									
15-16.	do.	July 17	25	110.0	.44	.4	1.4	4.88							
17.	Wellborn	Aug. 25	4	106.0	33.9	32.0									
15.	do.	July 20	25	42.0	.28	.5	.48	.52		(?)	625	603	1,228	.76	
15-16.	do.	Aug. 25	5	195.0	79.8	40.9	4.0	71.4		100	272	413	710	.43	
17.	Wellborn	June 26	100	3.6	0	0									
		July 20	25	52.0	.44	.8	.92	1.92							
		Aug. 25	5	109.0	52.8	48.4	1.4	100.6		(?)	494	672	1,167	.73	

a Average.

b About.

TABLE X.—Comparison of progress of infestation by boll weevil and production of fruit upon plats of cotton at College Station, Tex., in 1904.

Variety.	Date of examination.	Number of stalks.	Squares.				Blooms.		Bolls.			Weevils.		Yield per acre.					
			Total per plant.	Total punctured.	Per cent punctured.	Dropped.	Total.	Per plant.	Perfect.	Open.	Total per plant.	Punctured.	Total.	Per 100 stalks.	Pounds seed cotton.				
															Date.	First picking.	Date.	Second picking.	Total.
Jones's March planting.	May 22	2,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	0.08	.....	.....	.....	.....	.....
	May 30	2,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.08	.....	.....	.....	.....	.....
	June 17	400	5.5	36	1.6	5	.....	.....	.....	.....	.....	.....	3	.9	.....	.....	.....	.....	.....
	June 9	320	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.5	.....	.....	.....	.....	.....
	June 15	400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0	0	.....	.....	.....	.....	.....
	June 27	400	15	12	.2	0	174	0.43	55	.....	0.13	.....	2	0	.....	.....	.....	.....	.....
	July 13	50	39	7	.35	34	166	3.3	307	.....	6.1	.....	1	2	.....	.....	.....	.....	.....
	Sept. 12	25	4.5	98	86	(a)	0	.....	.....	455	22	108	36	144	Aug. 28	258	Sept. 14	252	510
	Sept. 12	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.04	.....	.....	.....	.....	32
King Imp. planting.	May 22	2,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.4	.....	.....	.....	.....	.....
	May 30	2,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.9	.....	.....	.....	.....	.....
	June 9	320	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.2	.....	.....	.....	.....	.....
	June 15	2,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)	.....	.....	.....	.....	.....	.....
	June 17	400	4.8	21	1.2	1	.....	.....	.....	.....	.....	.....	0	0	.....	.....	.....	.....	.....
	June 27	380	22	14	.2	92	164	.43	91	.....	.24	.....	2	4	.....	.....	.....	.....	.....
	July 13	50	43	18	.83	38	178	3.8	309	.....	6.2	.....	46	184	Aug. 27	313	Sept. 10	318	661
	Sept. 12	25	6.5	142	86	(a)	.....	.....	.....	491	23	83	4	.3	.....	.....	.....	.....	.....
	Sept. 12	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14	1.1	.....	.....	.....	.....	.....
Bennett's b Apr. planting.	May 22	1,200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(a)	0	.....	.....	.....	.....	.....
	May 30	1,200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.8	.....	.....	.....	.....	.....
	June 17	50	9.7	25	5.1	7	0	.....	.....	.....	.....	.....	0	0	.....	.....	.....	.....	.....
	June 9	250	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.4	.....	.....	.....	.....	.....
	June 27	400	25	152	1.5	8	53	.13	.....	.....	.....	.....	0	0	.....	.....	.....	.....	.....
	July 13	50	33	19	1.1	47	243	4.8	226	.....	4.5	.....	2	4	.....	.....	.....	.....	.....
	Sept. 12	25	1.3	27	84	(a)	0	.....	.....	700	31	90	37	148	.....	.....	.....	.....	.....
	June 7	200	0	0	.....	(a)	0	.....	.....	.....	.....	.....	0	.....	.....	.....	.....	.....	.....
	June 17	200	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....	.....
Native.	Sept. 16	25	1.8	34	79	(a)	0	.....	.....	217	10	36	24	96	.....	.....	.....	.....	.....
	June 7	275	.....	29	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....
	June 17	200	.....	32	.....	.....	.....	.....	.....	.....	.....	.....	7	3.5	.....	.....	.....	.....	.....
Native.	June 29	290	20	111	3.8	113	.....	.....	190	.....	.....	.....	0	0	.....	.....	.....	.....	.....
	June 7	530	.....	55	.....	.....	.....	.....	.....	.....	.....	.....	8	1.5	.....	.....	.....	.....	.....
	June 17	200	.....	61	.....	1	.....	.....	.....	.....	.....	.....	21	10	.....	.....	.....	.....	.....
Native.	June 29	364	16	128	2.7	137	.....	.....	156	.....	.....	.....	0	0	.....	.....	.....	.....	.....
	Sept. 16	25	2.8	65	91	(a)	.....	.....	.....	147	7.4	39	32	128	.....	.....	.....	.....	.....
	June 18	100	25	22	1.1	6	.....	.....	.....	.....	.....	.....	6	6	.....	.....	.....	.....	.....
Native.	July 14	40	63	1140	44	395	65	1.6	537	.....	13	.....	6	15	.....	.....	.....	.....	.....
	Sept. 16	25	3.2	71	88	(a)	.....	.....	.....	265	14	85	31	124	.....	.....	.....	.....	.....
	June 14	50	22	47	6.1	22	583	.....	.....	.....	.....	.....	7	14	.....	.....	.....	.....	.....
Native.	June 29	398	41	30	1.1	154	.....	.....	616	.....	.....	.....	0	0	.....	.....	.....	.....	.....
	July 14	40	18	437	57	121	55	1.4	419	.....	.....	.....	11	27	.....	.....	.....	.....	.....
	Sept. 16	25	9.5	219	92	(a)	.....	.....	.....	211	11	72	46	184	.....	.....	.....	.....	.....

^a Not counted.^b Consisted of a large number of varieties.

NOTE.—The five plats of native cotton referred to were planted by different farmers in the vicinity of College Station.

The proportion of squares punctured by the end of the first month after squares have commenced to form has been found to range from 2.5 to 10 per cent. It is usually not over 5 per cent, and an average proportion of 3 per cent would be more nearly correct. Thus, on the Brazos River, July 13, 1904, but 8 per cent of the squares were punctured. At the College on our main plats less than 1 per cent were punctured. At Eckol's, on June 14, 1904, 6.1 per cent were punctured and on June 29 but 1.1 per cent. In 1903 at the College not over 2 per cent were punctured during the first month of square formation. In the Brazos bottom in 1903 the proportion was less than 1 per cent. In 1901, on June 17, Mr. Teltschick reported to Professor

Mally that 10 per cent of the squares were punctured upon cotton which had been squaring for 5 weeks. At the end of the second month of square formation there is an increase of from ten to fifteen times in the percentage of punctured squares. On August 13, 1903, an average of 35 per cent of the squares on our plats were punctured, and on August 25 on Smith & Carson's plantation there were 42 per cent. On August 13, on the experiment station plat at the College barn, there were 65 per cent, these representing the injury done upon the emergence of the third brood of weevils. On July 14, 1904, Eckol's and Ayer's cotton had 57 and 44 per cent punctured, this being about 2 months after the first squares formed. In a general way, it seems safe to say that usually 50 per cent of the squares will be punctured by about 2 months after the cotton commences to square, at which time, as we have seen, there would normally be about 100 squares to the stalk. With the appearance of the third brood of weevils early in August the percentage of injury rises rapidly, and by September 1 from 85 to 90 per cent of the squares will be found punctured, tho it is rather unusual to find over 90 per cent of the squares punctured in this section when they are carefully counted. In 1904, at the end of 6 weeks of square formation, there were but 8 per cent of the squares punctured along the Brazos River, tho on the oldest cotton, which had been squaring about 2 months, where the weevils were thickest, 40 per cent were punctured. When one-half of the squares are punctured it may be readily concluded that there are probably sufficient weevils present to prevent any more squares from forming fruit. It will be seen, therefore, that the critical period in the relation between natural increase of squares on the plant and the increased injury by the boll weevil is during the period of 6 to 8 weeks after first squaring, which usually coincides more or less closely with the time between the appearance of the second and third broods of weevils. Thus, if we consider 6 weeks as the average time required for cotton to begin to square after planting, it will be seen that the bulk of the fruit must be set in 85 or 90 days after planting. In other words, it may be readily seen that to escape injury by the boll weevil cotton must be so grown that the bolls will commence to open in about 100 days after planting, and that all the fruit which will probably be secured must be set within 45 days after the squares begin to form. The advantage of early planted cotton and rapid maturing varieties becomes, therefore, very apparent.

PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

NOTES ON THE BIOLOGY OF CERTAIN WEEVILS RELATED TO THE COTTON BOLL WEEVIL.

By W. DWIGHT PIERCE,
Special Field Agent.

INTRODUCTION.

During the year 1905 considerable knowledge was gained concerning the biology of Texas weevils. The practical importance of this information lies in the possibility that from some of these species parasites may be artificially induced to transfer their activities to the boll weevil (*Anthonomus grandis* Boh.). But it has a further interest in that it makes possible a comparison between the life history of this important enemy of cotton and that of related insects which normally inhabit regions into which that pest has only recently made its advent.

Anthonomus grandis breeds during the entire growing season, from April to October, and on one plant—cotton. Its host plant is so plentiful that there is a constant food supply. *Anthonomus signatus* Say, which breeds in immense numbers in the flowers of strawberry, blackberry, dewberry, and redbud, is not known to have more than the short period of activity limited by the fruiting of its host plants. Hence the possibility of transferring parasites would be limited to a short period and there would be further difficulties on account of the local distribution of the food plants. *Anthonomus æneotinctus* Champ., which has been found to breed in enormous numbers in pepper, in western Texas, is not known to occur on other food plants in the spring and early summer, inasmuch as only a part of its cycle of life has been determined.

These three species are the most important of the Texas economic Anthonomi, and from the two latter little may be expected in assisting in the control of the boll weevil, altho it may be important to suggest

that the parasites of *Anthonomus signatus* might attack *Anthonomus æneotinctus* if the strawberry and pepper were grown side by side. The former weevil has long been established and has numerous parasites. The latter has not been here long and has not extended its foothold greatly, neither has it many parasites. Both of these species are small, and perhaps not likely to yield parasites which would attack larger species.

Of the large species equaling the boll weevil in size some may, perhaps, yield favorable results. *Anthonomus fulvus* Lec. gives promise in one way because it breeds in the buds of *Callirrhoe involucrata*, a mallow closely related to cotton. But this plant ceases flowering early in July, which would make transfer of parasites difficult. The biology of this species is extremely like that of the boll weevil, and it would appear to be easier for parasites to change from it to its more injurious relative than from the two species mentioned before. *Anthonomus squamosus* Lec., which breeds along the western edge of the cotton belt in the flowers of *Grindelia squarrosa nuda*, is much more abundantly parasitized than *A. fulvus* has proven to be. Its food plant has a long season, so that several generations are produced. Both of these species seal the egg puncture and pupate in a cell formed by the larval excrement, just as does the boll weevil. Both are parasitized likewise by *Bracon mellitor* Say, a parasite of *Anthonomus grandis*. *Eurytoma tylodermatis* Ashm., listed as a parasite of *Anthonomus grandis*, is a primary parasite of *Lixus musculus* Say and probably also of *Anthonomus squamosus*. Another species of *Eurytoma* was definitely bred from *A. squamosus*. *Anthonomus scutellaris* Lec. is known to breed in wild plums in Texas. *Desmoris scapalis* Lec., a weevil very similar in habits to the boll weevil, breeds in the flower heads of *Sideranthus rubiginosus*, thus resembling *A. squamosus*, but differing from the *Anthonomi* mentioned, in that it undoubtedly pupates in the ground. This species is very abundant in the heart of the weevil-infested area of the cotton belt and occurs thruout a considerable part of the summer. Moreover, it is often parasitized.

Of the smaller species those to be noticed are not smaller than the smallest of *A. grandis* and *A. squamosus*. *Anthonomus disjunctus* Lec., like the latter, breeds in the flower heads of *Heterotheca subaxillaris*, a common composite thruout central Texas. It is very numerous and considerably parasitized. *Anthonomus æneolus* Dietz breeds abundantly in the buds of *Solanum rostratum*, which occurs thruout Texas. *Catolaccus incertus* has been bred as a parasite.

The nature of the problem being thus set forth, it will be readily understood that the primary requisite is a knowledge of the breeding habits of as many species of weevils as possible.

The following notes bear upon the biology of certain of the Texas weevils. The determinations are by Messrs. E. A. Schwarz, W. H. Ashmead, and J. C. Crawford, in those groups respectively in which they are specialists.

ANTHONOMUS DISJUNCTUS Lec.

This species was found breeding in large numbers on *Heterotheca subaxillaris* at Jacksonville, Tex., by Mr. C. R. Jones and the writer. It oviposits in the bud at the base thru the involucre. The presence of the weevil is indicated by the blackening of the two or three involucral bracts which were punctured. The larva feeds among the seed in the seed-head, and forms a compact cell of its exuviae. Here it pupates and the adult emerges from the dried head.

PARASITES.

Three pteromalids were bred from a few buds brought in to the laboratory.

ANTHONOMUS FULVUS Lec.

Mr. W. W. Yothers has carried out an extensive series of notes on the biology of *Anthonomus fulvus* incident to his finding the host plant of this species. On June 9 the first weevils were taken, and found to be very abundant on the flowers of the purple mallow, *Callirrhoe involucrata*. This was, then, the weevil that had been sought so long—a native insect infesting a close relative of the cotton, and with life history parallel in all details to that of the boll weevil. The questions at once arose as to whether the new weevil was held in check by parasites which might be transferred to the boll weevil, whether it had more than one host plant, whether it would feed on cotton, and whether the boll weevil would feed on the mallow.

The work of the season of 1905 answered some of these questions, but not the one of primary interest. Only one parasite was bred, viz, *Bracon mellitor*, already known as a primary parasite of *Anthonomus grandis*. If this parasite was not originally parasitic on *A. grandis* and was so on *A. fulvus* we may reasonably expect that any other primary parasite of the latter may be induced to transfer its energies against the former.

The host plant, *Callirrhoe involucrata*, is largely distributed over the Mississippi River basin, and its guest, *Anthonomus fulvus*, is known by previous record to occur in Kansas and by observations of this laboratory to breed at Ardmore, Ind. T. (C. R. Jones, collector), and Dallas and Victoria, Tex. Thus it is highly probable that the weevil's range is at least coextensive with the range of this host plant.

The plant is a spring bloomer, thriving in May and June in Texas and gradually later toward the north. According to the laboratory

records, the weevil's activity is probably limited to the flowering activity of the plant, after which it goes into estivation and hibernation.

The weevil generally oviposits in the bud, altho perhaps also in the ovary. The egg puncture is immediately sealed, just as by *Anthonomus grandis*. Owing to the brief period from bud to flower the metamorphosis is comparatively rapid. The only observation on this point limited the pupa stage to less than 4 days. The egg is lemon-yellow, elliptical, measuring 0.375 mm. in breadth and 0.484 mm. in length. It is placed among the anthers, generally near the base of the floral column. Incident to the act of oviposition the petals become sealed by the released juices and are prevented from fully opening, so that the developing weevil is still protected from its enemies. Larvæ or pupæ are often found thus in the sealed flower, and are sometimes still in this part after it has dropt. On the other hand the larvæ frequently eat into the ovary and there construct a pupal cell of their excrement. The weevils may oviposit in the ovary, altho no definite record was obtained. The ovaries are largely infested by a very small weevil, which is as yet undetermined. After June 9 neither copulation nor oviposition was observed.

July 4 was the last date of finding larvæ in the field. Thirty-two flowers had but two larvæ, and two showed feeding punctures. On July 1 seven adults were taken in the field. The Callirrhoe ceased blooming about July 10. As the weevils in the breeding cages ceased to feed on the flowers early in July, they were placed with a plant in a large breeding cage for estivation on July 27. The Callirrhoe plants were induced to bloom until about November 1 by transplanting, but the weevils did not seem inclined to feed again. A weevil which had not fed for a month was still active August 9, and on August 16 was observed to feed on the flowers of the host plant.

The weevils normally feed on the anthers and on the surface of the petals. They refused to touch the foliage. When offered a choice of Callirrhoe or cotton blooms, they almost invariably went directly to the former. When given cotton alone they were observed to feed on the pollen and petals and in one case indication of feeding on the square was observed.

In habit the weevil is like *Anthonomus grandis*. It is susceptible to movement and when conscious of a disturbance remains alert on the edge of a petal. A slight movement will cause it to drop to the ground, where it is almost impossible to find it. It is a very ready flyer and goes from plant to plant in this manner.

ANTHONOMUS SQUAMOSUS Lec.

This species was found breeding in very large numbers by Mr. C. R. Jones and the writer on *Grindelia squarrosa nuda* at Clarendon, Tex. It has previously been recorded from the same plant in Colorado and

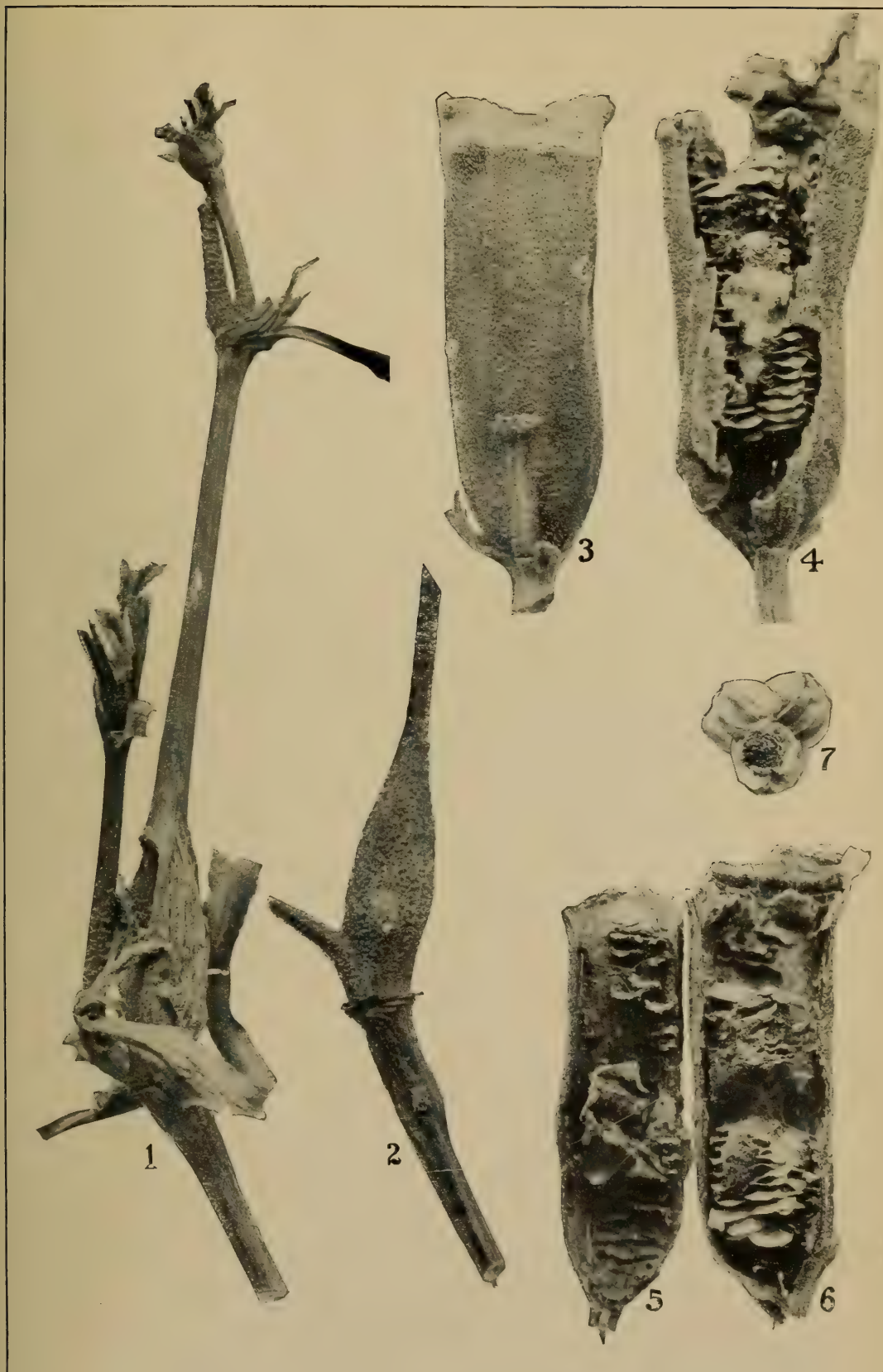
WORK OF *LIXUS MUSCULUS* AND *ORTHORIS CROTCHII*.

Fig. 1.—Gall of *Lixus musculus* and exit hole of adult on stem of *Polygonum pennsylvanicum*.
 Fig. 2.—Gall of *Lixus musculus* and entrance hole (closed) of pyralid caterpillar on stem of *Polygonum*. Fig. 3.—Pod of *Mentzelia nuda*, showing two egg punctures of *Orthoris crotchii*.
 Fig. 4.—Pod of *Mentzelia* opened, showing a cluster of *Orthoris crotchii* cells, and the cocoons of *Tetrastichus*. Figs. 5, 6.—Interior of pod of same, showing several cells of *Orthoris crotchii*.
 Fig. 7.—An isolated cell of *Orthoris crotchii*, showing the manner in which the seeds are eaten. (Original.)

what was supposedly the same species from *Helianthus* in Kansas. It oviposits in the bud or flower at the base thru the involucre. The presence of the weevil is indicated by the blackening of the two or three punctured involucral bracts. The larva feeds among the ovaries in the flower head and forms a compact cell from its exuviae. This cell is the more compact because of the sticky nature of the flower. Here it pupates and matures, the adult emerging from the dry seed head. The specimens secured differ greatly in size, color, and vestiture.

PARASITES.

Bracon mellitor Say was bred in large numbers from the larvæ.

Eurytoma tylodermatis Ashm. was bred in large numbers as a primary parasite.

Catolaccus sp. One specimen of this genus was bred, and is presumably a primary parasite.

An undetermined noctuid caterpillar, which eats out the heads of the *Grindelia*, destroys all weevils breeding in the flowers it attacks.

LIXUS MUSCULUS Say. (Pl. I, figs. 1, 2.)

This species was found by Mr. C. R. Jones and the writer breeding in considerable numbers in the stems of *Polygonum pennsylvanicum* at Clarendon, Tex. It oviposits near the joints of the stem, and the young larva as it feeds causes the stem to enlarge and form a gall-like cell. These galls are twice the diameter of the stem and about three-quarters of an inch long. The growing weevil fits its cell tightly, and consequently, after maturing, it takes some time for it to gain an exit. The adult gnaws a round hole in front of its head and then gradually forces itself out.

PARASITES.

Glyptomorpha (*Bracon*) *rugator* Say. One adult was bred from the weevil and numerous pupæ were found in the cells. The pupa is inclosed in a brown papery cocoon, which completely fills the cell and crowds the remains of the *Lixus* against the wall.

Eurytoma tylodermatis Ashm. was bred as a primary parasite.

Neocatolaccus tylodermæ Ashm. was bred as a primary parasite. This species has been bred also from boll-weevil-infested squares.

Cerambycobius cyaneiceps Ashm. One specimen was bred from an infested stem, and is probably a *Lixus* parasite.

Eurytoma tylodermatis Ashm. One individual bred from an infested stem and probably a parasite of *Lixus*, tho perhaps hyperparasitic.

A pyralid larva which dwells in the stems of this plant seems to be very fond of this weevil, as it not only eats those which lie in its path but has been frequently seen to cut a hole into the galls from the outside

and to feed on the inmate. It makes no choice of the stage of the weevil to be eaten; larvæ, pupæ, and adults have been found partly devoured.

ORTHORIS CROTCHII Lec. (Pl. I, figs. 3-7.)

This species was found by Mr. C. R. Jones and the writer breeding in *Mentzelia nuda* at Clarendon, Tex. It oviposits in the ripening seed pods, and the larva makes its cell in the center of six or seven of the flat transverse seeds. Very often four or five weevil cells will lie side by side, occupying a large part of the interior of the pod. The cells are made up of the exuviae of the larvæ. Exit is secured thru the open apex of the ripe pod.

PARASITES.

Microbracon (*Bracon*) *nuperus* Cress. was bred in very large numbers as a primary parasite. The air around the *Mentzelia* bushes was thick with individuals of this and the next species. Several definite records of hyperparasitism by *Tetrastichus* were obtained. The latter construct beautiful little white cocoons, and several feed on one host.

Tetrastichus sp. A very large number of these specimens were bred from the *Mentzelia* pods, and several very definite cases of primary parasitism were recorded.

PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

AN ANT ENEMY OF THE COTTON BOLL WEEVIL.

(*Solenopsis geminata* Fab. var. *xyloxi* McC.)

By W. E. HINDS,

In Charge of Cotton Boll Weevil Laboratory.

INTRODUCTION.

That native species of ants are the most important predatory enemies of the boll weevil is an admitted fact, but the real extent of their beneficial work has probably been underestimated rather than overestimated. Several species have been found attacking the weevil in some of its stages, but by far the most important one as yet observed is a rather small species determined by Dr. W. M. Wheeler as *Solenopsis geminata* Fab. var. *xyloxi* McC. This ant is quite variable in size and color, and the different forms found in Texas have been separated into several varieties. As it is probable that the food habits are similar in each of these forms, the varietal distinctions need not be emphasized here.

Doctor Wheeler has kindly furnished the following information:

The species is common everywhere in the warmer parts of the world, and is both highly carnivorous and highly vegetarian; that is, it will prey on any defenseless or moribund insects, and stores seeds in the chambers of its nest. It stings very severely, whence the name "fire-ant" or "*Hormiga brava*," which is given it in Spanish America. The dark variety you sent is common in the black soil, such as one finds in cotton fields. I have seen it in great abundance in the vicinity of Austin, Tex.

DESCRIPTION.^a

For the present purpose this ant may be characterized as follows:

There are two distinct nodes or scales in the slender petiole of the abdomen. All forms but the male have a sting. The antennæ are ten-segmented; the club is formed of the last two segments, of which the terminal one is the longer. Maxillary and labial palpi have each two segments. The clypeus has two longitudinal ridges and the sting is very large. The color varies, but the workers usually seen are of a dark reddish brown, the color of the abdomen being often considerably darker than that of the head and thorax. Length of workers from 2 to 3 mm.

^a For illustration of the species see Bul. 51, Bur. Ent., U. S. Dept. Agric., fig. 8, p. 149.

AN ENEMY OF THE COTTON LEAF-WORM AND BOLLWORM.

This species has long been known as an important enemy of the cotton leaf-worm (*Alabama argillacea* Hbn.), what is probably the first notice of its good service in this connection having been published in 1847. Since that time so many observers have reported it as attacking the eggs, larvæ, and pupæ of the leaf-worm that there can be no doubt of the substantial accuracy of the conclusion that it is one of the most important predaceous enemies of that cotton pest.

While less study has naturally been given to the relationship of ants to the cotton bollworm than to the leaf-worm, it has been shown repeatedly that the species under consideration preys upon both the eggs and larvæ of the bollworm in much the same way as it does with the leaf-worm.

ITS WORK AS AN ENEMY OF THE COTTON BOLL WEEVIL.

Considering the important place that these ants hold among the natural foes of the two cotton pests of most serious importance before the advent of the Mexican cotton boll weevil, it is not at all surprising to find it filling a high place as an enemy of the weevil. For several years it has been known that ants frequently attack the immature stages of the weevil in both squares and bolls, but observations made during the season of 1905 have shown that this native ant may be—at least under favorable conditions—a more important factor in the destruction of the weevil than has hitherto been supposed.

During the experiment which was being made to test the effect of direct sunshine in destroying immature stages of the weevil, 150 squares were selected, each of which was believed to contain some stage of the insect. These squares were divided into two lots of 75 squares each and placed upon the bare ground in an exposed spot in the cotton plat at the laboratory in Dallas, Tex. One lot was left dry, while the other was thoroly wetted to determine whether the mortality would be as great in exposed squares which were kept moist. The squares were placed on the ground at 4.30 p. m., September 5. The following morning, while again wetting the lot which was to be kept moist, numerous ants were noticed running around and over the squares, tho no sign of a nest had been seen near that spot on the previous evening. A hasty examination showed, in several squares, holes (fig. 7, *b*, *c*) which in size and external appearance resembled weevil emergence holes (fig. 7, *a*) so closely that at first they were mistaken for them, and it was feared that the stages of the weevil in the squares were too nearly mature to serve as suitable material for the experiment intended. A more careful examination, however, showed that the weevils were not emerging, but that the holes in the squares were really entrance holes made by the ants to enable them to get at the immature weevils within. As it was evident that nearly all of the squares had been opened, the experiment intended was abandoned and a complete examination made of all the squares.

It was soon found that the ant-made holes could, from internal conditions if not from external appearances, be distinguished positively from those made by the weevil, and it was also possible to tell with considerable certainty whether the victim was in the larval or the pupal stage, tho in only a few cases had the ants left any remains of their prey. A careful examination of the interior of a square from which a weevil has emerged shows invariably a small quantity of fine débris removed by the weevil from the wall of the square in cutting its way out. Besides this, there is a small amount of white excrementitious material, the final product of the transformation, which is voided by the weevil before it leaves its cell.

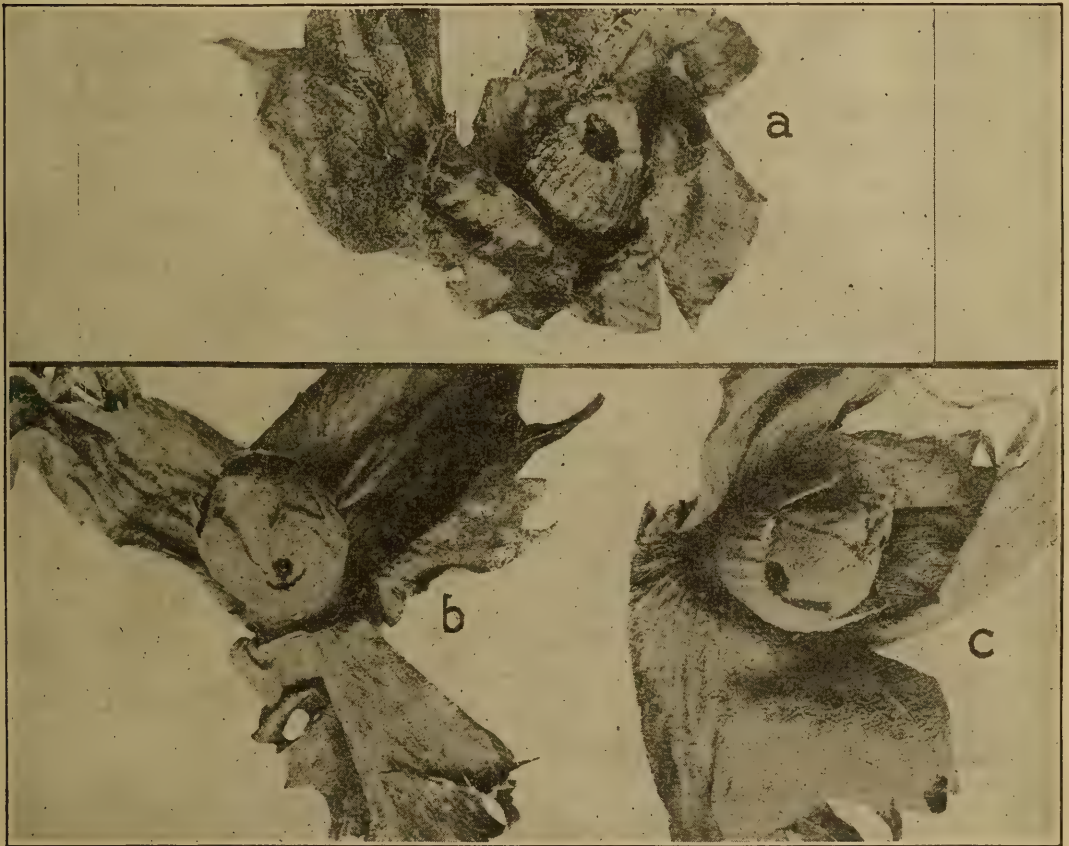


FIG. 7.—An ant enemy of the cotton boll weevil: *a*, cotton square showing emergence hole of boll weevil; *b*, *c*, cotton squares showing entrance holes of *Solenopsis geminata* var. *xyloni*. Slightly enlarged (original).

In cases where the squares had been entered by ants and an immature stage destroyed, neither of these signs of adult weevil activity could be found, but the stage of the weevil could in most cases be told from the presence or absence of the larval exuviae, which are generally untouched by the ants.

In the lot of 75 squares kept dry it was found that the ants had entered 64, destroying 44 stages which were probably larvæ and 20 which were probably pupæ. Eleven squares showed no ant holes. Of these, 7 contained no weevil stage, 3 contained live, unharmed larvæ of a parasite of the weevil (*Bracon mellitor* Say) and the

remains of the weevil larvæ destroyed by them, and 1 a dead, moldy weevil larva.

In the lot of 75 squares kept wet the ants had entered 73, destroying 50 stages which probably were larvæ and 23 probably pupæ. The 2 squares not entered by the ants had contained no stages of the weevil. No signs of parasite destruction could be found in this lot of wet squares.

A brief summary of the examination of these 150 squares shows that 9 of them did not contain any stage of the weevil. Not one of the uninfested squares nor, apparently, any one of those containing a parasitized or dead larva was opened by the ants. Among the 137 squares opened by the ants not a single weevil stage escaped destruction, tho the squares had been on the ground but eighteen hours.

The unquestionable connection of these ants with the rapid and complete destruction of every living weevil stage in 150 squares shows their possible efficacy in the field under conditions which favor their work. The ants were not exceptionally abundant where the foregoing demonstration occurred. The nearest nest was under a cotton plant about 3 feet from the bare spot where the squares were exposed.

On September 25 an examination was made of 300 fallen squares and small bolls collected at random from the ground in this plat. It was found that at that time the ants had destroyed 40 per cent of all weevil stages infesting those squares and bolls. October 6, in an examination of 212 fallen squares and small bolls, it was found that the ants had destroyed 35 per cent of the weevil stages. Observations made after November 1 indicated that the ants had then practically ceased their activity, only about 10 per cent of the weevil stages having been destroyed. The ants appear to be unable to enter the square or small boll until after decay has softened and weakened the resistance of the walls inclosing the weevil.

DISTRIBUTION.

These ants nest in the cotton fields and appear to be distributed over most if not all of the cotton belt. Their activity is far greater during hot dry weather than during cold wet weather; and this fact may account in some measure for the effect which wet weather is said to have in greatly increasing the numbers and destructiveness of the insect pests of cotton.^a

During the past season *Solenopsis geminata* var. *xyloxi* has been taken from infested cotton fields in many localities in Texas and western Louisiana. It seems to be perfectly at home in various types of soil, and is undoubtedly of considerable benefit as an established enemy of the weevil in practically all of the area now infested.

^aBul. 51, Bur. Ent., U. S. Dept. Agric., pp. 137-138.

PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

A PREDATORY BUG REPORTED AS AN ENEMY OF THE COTTON BOLL WEEVIL.

(*Apiomerus spissipes* Say.)^a

By A. C. MORGAN,
Special Field Agent.

INTRODUCTION.

On May 3, 1905, the writer was sent to Gurley, Tex., to investigate the finding, by Mr. Sam. Allen, of that place, of a bug which he reported as an enemy to the Mexican cotton boll weevil (*Anthonomus grandis* Boh.). Mr. Allen had collected only one specimen, a nymph of *Apiomerus spissipes* Say. It was taken to Dallas, Tex., where it soon molted and became adult. Other adults were afterwards placed under observation at Dallas in order that the life history and habits of the species might be studied to determine to what extent it was an enemy of the boll weevil, and whether or not it is likely to become of economic importance.

Credit is due Mr. W. W. Yothers for valuable notes upon the life history of this species, especially as regards its food habits.

LIFE HISTORY.

Copulation.—May 23, 1905, a pair was observed in copulation in the field for over 6 hours at Gurley. Later, at Dallas, a pair was in copulation for 4 hours, and another pair for 3 hours. During the process the female assumes the normal position while the male clings to one side of her, holding on with the fore and hind legs.

Oviposition.—The eggs are laid in masses (fig. 8, *b*) of 40 to 60, tho as few as 10 were recorded in one instance and 23 in another. Individual records are as follows: 37, 41, 49, 54, and 64. The usual place for oviposition is the underside of a leaf, near the top of the plant. Egg masses have been collected in this position from *Ambrosia* sp. and *Helianthus* sp. The eggs are placed so close to each other, side by side, that in the center of the mass, instead of being cylindrical, they are usually more or less hexagonal.

The egg.—The egg (fig. 9) is cylindrical, finely punctured, and varies in color from a bright yellow when first deposited to a light brown

^aOrder Hemiptera, family Reduviidæ.

just before hatching. The collar is shining white. The dimensions of the egg are as follows: Width at narrowest part—just

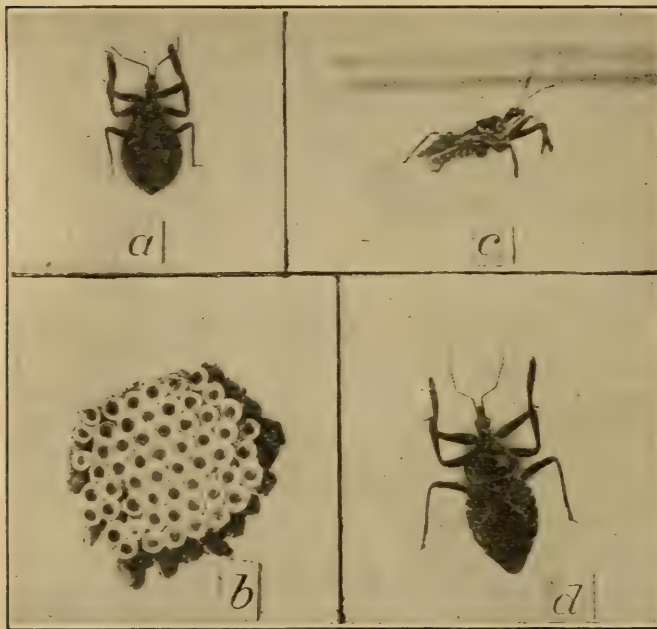


FIG. 8.—*Apionerus spissipes*: a, nymph, 5th instar; b, egg mass; c, adult, side view; d, same from above. a, c, d, natural size; b, enlarged (original).

below collar—0.5 mm.; greatest width, 0.64 mm.; length below collar, 1.51 mm.; length of collar, 0.26 mm.; total length, 1.77 mm. The width of the collar varies from slightly less than the greatest width of the egg to slightly more.

Incubation.—Incubation varies slightly in the time required in different egg masses. Thus, in May, under conditions exactly the same, incubation required 12 days in one instance and 16 in another. During mid-

summer 10 to 12 days were sufficient. Later, in the fall, 14 to 16 days were required.

FOOD.

The insects preyed upon in the laboratory embraced the orders Orthoptera, Hemiptera, Lepidoptera, Diptera, and Hymenoptera. The process of feeding is a long one and varies with the size of the prey. In general the reduviids lie in wait in an alert attitude for the approach of an insect and then spring upon it, but frequently they take the initiative and fly or run toward an insect. The insect fed upon is not left until all the juices are sucked from its body. Sometimes this takes only a half hour, at other times the reduviid feeds for one or two hours. Boll weevils fed upon by *Apionerus spissipes* are often as dry and crush almost as easily between the fingers as do pinned specimens. The first puncture by the beak of *spissipes* is generally fatal. In the case of boll weevils, upon which *spissipes* frequently fed, the weevil made only a few spasmodic movements after

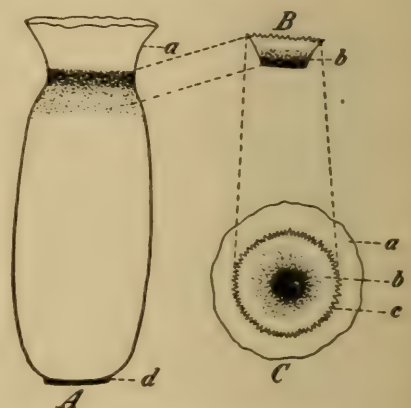


FIG. 9.—Egg of *Apionerus spissipes*: A, side view of egg; B, egg-cap, side view; C, top view of egg; a, collar; b, egg cap; c, point of junction of egg cap with egg; d, attachment of egg to leaf. Much enlarged (original).

the first insertion of its captor's beak, and then ceased to move. The power of the bite of this insect was well illustrated upon the writer while collecting specimens. One adult inserted his bill in the end of the thumb. The pain at first was not so great as that from the sting of a bee or wasp, but in a few moments it was much greater than the writer had ever experienced from any hymenopteron's sting. It continued unabated for over an hour, and the spot was tender to the touch for two weeks.

Altho locusts, bees, wasps, and an occasional moth were eaten, Coleoptera and Diptera were preferred. The following tables give the food for a number of days of a nymph of *Apiomerus spissipes*, and, for comparison, the food of another reduviid (*Sinea diadema* Fab.):

Food of nymph of Apiomerus spissipes in third instar.

Date.	Pepper weevils (<i>Anthonomus xneo-tinctus</i>).				Boll weevils (<i>Anthonomus grandis</i>).			
	Number added.	Number killed.	Number alive from previous day.	Total number alive.	Number added.	Number killed.	Number alive from previous day.	Total number alive.
October 16.....	3			3	1	0		1
17.....	5	3	0	5	0	0	1	1
19.....	7	5	0	7	0	0	1	1
20.....	5	5	2	5	0	0	1	1
21.....	7	3	1	8	0	0	1	1
23.....	20	7	1	21	0	0	1	1
24.....	0	11	9	10	0	0	1	1
25.....	0	4	5	5	0	0	1	1
26.....	0	2	3	3	0	0	1	1
28.....	5	3	0	5	5	0	1	6
30.....	0	0	5	5	0	2	4	4
November 2.....	0	2	3	3	0	1	3	3
4.....	0	1	2	2	0	0	3	3
6.....	5	2	0	5	0	0	3	3
8.....	0	2	3	3	0	0	3	3
Total.....		50				3		

The nymph did not feed after November 8. On December 1 it was placed in a cool room for hibernation, but must have died shortly afterwards, for on January 25, 1906, it was found dead and shrunken.

Food of an adult Sinea diadema.^a

Date.	Pepper weevils (<i>Anthonomus xneo-tinctus</i>).				Boll weevils (<i>Anthonomus grandis</i>).			
	Number added.	Number killed.	Number alive from previous day.	Total number alive.	Number added.	Number killed.	Number alive from previous day.	Total number alive.
October 16.....	3			3				
17.....	5	3	0	5				
19.....	7	5	0	7				
20.....	5	5	2	7				
21.....	5	2	0	5				
23.....	14	4	1	15				
24.....	9	11	4	13				
25.....	11	12	1	12				
26.....	0	8	4	5	1			1
28.....	5	3	1	6	5	1	0	5
30.....	1	1	5	6	4	4	1	5
November 2.....	2	3	3	5	3	4	1	4
4.....	0	2	3	2	0	1	3	3
6.....	0	2	3	3	0	2	1	1
Total.....		61				12		

^a The specimen died November 10.

It should be noted in these tables that while the nymph of *Apiomerus spissipes* killed 50 pepper weevils, and *Sinea diadema* 61 during the same period, yet *spissipes* killed only 3 boll weevils, while *Sinea* killed 12. These results indicate that little benefit can be expected from *spissipes* in the early stages. The boll weevil is too large for the nymphs to capture easily, hence the choice of the smaller, pepper weevils. It would appear also that a boll weevil diet is not a perfect one, for in the experiments with boll weevils as food for adult *spissipes* all died in a short time. One adult ate 27 weevils in thirteen days, but died on the fourteenth day. Other experiments gave similar results. The table shows also that *Sinea* does not prefer a diet of boll weevils. It ate only 20 per cent as many boll weevils as pepper weevils, altho active enough and strong enough to capture and kill them easily.

An adult *Apiomerus spissipes*, under observation from June 1 to July 3, ate 2 flies, 22 ladybirds, 1 bee, and 1 specimen of the twelve-spotted cucumber beetle (*Diabrotica 12-punctata* Oliv.), but died on July 6. Another adult, under observation from June 10 to 21, when it died, ate *D. 12-punctata* and a few ladybirds, but refused the potato beetle (*Leptinotarsa decemlineata* Say) and its larvæ and the sharp-shooter (*Homalodisca triquetra* Fab.).

Other adults thrived for a time on house flies, but, like those fed upon weevils, they could not be kept alive. Neither did any combination of the above foods produce any better results.

Food of the young.—The impossibility of keeping the young alive thru more than two or three instars leads to the conclusion that proper food was not supplied them. On June 10 several specimens of *Apiomerus spissipes* hatched and were placed in a cage and supplied with cotton aphides (*Aphis gossypii* Glov.) in abundance. Altho fresh food was supplied daily, *spissipes* fed very rarely, and on July 3 the experiment was terminated by the death of the last of the nymphs. Other experiments with the cotton aphids resulted as in the preceding. October 3 a nymph nearing the third instar was fed upon nymphs of *Pentatoma ligata*. It ate 3 nymphs on the 3d and 4th, but died on the 5th. A combination of *ligata* nymphs and cotton aphides failed to keep another *spissipes* alive more than a few days. On September 6, 3 specimens of *spissipes* which had just hatched were isolated in a jar containing the egg mass from which they came. On September 8 all were dead. This experiment was made to determine whether the egg mass furnishes food for the first instar, as is the case with some pentatomids. From this experiment, and a subsequent one which gave the same results, it is evident that no food is obtained from the egg mass.

The best results were obtained by breaking open heads of Ambrosia in bloom and letting the *Apiomerus spissipes* nymphs select food from the insects frequenting this flower. Among the insects found in Ambro-

sia flowers *spissipes* fed upon *Triphleps insidiosus*, a species of the weevil genus *Apion*, many thrips, and larvæ and pupæ of a cecidomyiid gall-maker.

Cannibalism.—Cannibalism occurs in this species, but is not commonly indulged in. On October 3 three specimens of *Apiomerus spissipes* that had not fed since hatching were put in each of four pill boxes, without food. The first death occurred October 7, the last October 9. No instances of cannibalism occurred. Other experiments with newly hatched unfed nymphs gave the same result—no cannibalism. October 1 twenty-two specimens hatched and were fed upon insects found in heads of *Helianthus*. October 7 two nymphs were observed eating a third, and again on October 9, 10, and 12 the same observation was recorded. Other instances must have occurred in the intervals between observations, which would account for the death of individuals not apparently weak or diseased. It is evident, therefore, that the species is cannibalistic, but it is apparent that the first food must be obtained more easily than it could be by a contest with one of its kind of equal age and strength. In nature, however, where each individual goes upon a separate quest for food, it is very unlikely that cannibalism is a serious menace to the species.

LENGTH OF LIFE CYCLE.

Owing to the abnormal conditions in the laboratory, which made it very difficult to keep either young or old *spissipes* alive, the length of the instars could not be gaged with certainty. The time between copulation and oviposition varied from 4 to 7 days. Incubation required 10 to 16 days, according to season. The third molt in one instance occurred 12 days after the second, yet specimens have lived more than a month after the second molt without molting. The absences of the writer from the laboratory for a period of weeks at times destroyed the continuity of the experiment, and made it impossible to follow the life history as closely as was desired. However, there can not be more than a fragment of the second generation in a single season. Proper and improper food supply was undoubtedly the cause of the great variation in the length of instars noted above. In nature the same conditions of food supply undoubtedly exist, thus making a difference of months in the maturity of individuals hatched from the same egg mass. Observations in the field bear out this conclusion.

At no time during the year of 1905 could the young be found in any numbers. Altho adults were frequently observed in copulation in June and July at Gurley, later observations failed to disclose more than a few young. It is reasonable to suppose that among the survivors that finally reached maturity some encounter almost perfect con-

ditions as regards food, while others are barely able to exist, thus lengthening the instars and delaying maturity and greatly increasing the length of the life cycle.

NATURAL ENEMIES.

Only one natural enemy was recorded during our observations upon this species. This was a proctotrypid egg parasite, which Doctor Ashmead pronounced a new species of the genus *Hadronotus* Först. Only one egg mass was collected from the field. Of these eggs 12 per cent were parasitized.

DISTRIBUTION.

Say, in describing this species, reports it as being very abundant in Arkansas. Stål, in his *Enumeratio Hemipterorum*, reports it from Mexico and Texas. In the *Proceedings of the Iowa Academy of Sciences* Osborn reports it from Albuquerque, N. Mex. In 1905 it was collected in Texas at San Antonio and Cotulla by J. C. Crawford, at Handley by J. C. Crawford and W. D. Pierce, at Rosser by C. R. Jones and F. C. Bishopp, and at Gurley and Dallas by the writer. Pittier reports it also from Cruz de Guanacaste, Costa Rica, in Inverbrados de Costa Rica.

CONCLUSION.

Altho the experiments upon *Apiomerus spissipes* were conducted in the laboratory under conditions more or less unfavorable to the species, yet enough has been learned of its food habits to class it as a species of doubtful economic value, if not one of positive injury. Also, its scarcity in cotton fields, even tho abundant upon the borders, argues unfavorably. Only occasionally have specimens been observed upon cotton plants, and in the instances when these were observed feeding it was always upon ladybirds. Again, in midsummer, when weevils were most numerous, *spissipes* could not be found either in the cotton fields or near their borders.

The only injurious insects fed upon were the boll weevil (*Anthonomus grandis*), the pepper weevil (*A. æneotinctus*), the twelve-spotted cucumber beetle (*Diabrotica 12-punctata*), and a few house flies. This was in laboratory experiments. It is doubtful if any of these are fed upon more than occasionally in the field, for not a single instance has been recorded.

Lastly, the great mortality of the young and consequent paucity of adults, the unspecialized food habits, the failure to feed to any appreciable extent upon harmful insects, and the practical disappearance of the species from the vicinity of cultivated fields during a part of the summer would unquestionably place *Apiomerus spissipes* among insects of economic insignificance.

PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

NOTES ON THE PEPPER WEEVIL.

(*Anthonomus æneotinctus* Champ.)

By F. C. PRATT, *Assistant*.

OCCURRENCE IN TEXAS.

In a previous bulletin^a Mr. C. M. Walker gives an account of the pepper weevil, which had been injuring peppers in Texas. Investigation during the fall of 1905 resulted in proving the disappearance of this insect at Boerne, Tex., where it was first reported. Diligent search in October and November by the writer, who was assisted by Mr. L. Lamm, failed to show the existence of the weevils at that place, altho peppers had been grown as extensively as before.

At San Antonio, Tex., many truckers had given up the growing of peppers on account of their experience the year previous, and on one patch at Collins Gardens fully 80 per cent of the pods were attacked, and several bushels of chilli and sweet peppers were shipped from there to Dallas for observation.

Several places, Floresville, Seguin, and New Braunfels, in the vicinity of San Antonio, were visited to ascertain the extent of the infested territory, but without success. Corpus Christi also was visited, but no injury was noticed and no reports were obtained concerning the weevils.

Mr. J. C. Crawford reported the presence of the weevil about 8 miles south of San Antonio, the grower having claimed to have noticed this insect for several years. At Cotulla, Tex., Mr. Henry Caley reported slight injury at one of his truck farms near that place, altho the insect was not seen by the writer.

ORIGIN.

That this insect (adult, fig. 10) has been introduced into the United States from Mexico in recent years, there is no doubt, the exact date at this time being undeterminable. Inquiries at San Antonio commission houses elicited the information that peppers were shipped from Laredo, Artesia, and Cotulla. As a matter of fact, few peppers are raised at these places, the principal crop being onions. Mr. Caley, at Cotulla, denied ever shipping peppers and was very skeptical about

^a Bul. 54, Bur. Ent., U. S. Dept. Agric., pp. 43-48, 1905.

any having been shipped from there at any time. Further information showed that peppers were bought up in carload lots in Mexico and shipped to the United States and without much doubt rebilled from the localities mentioned to give an impression that these peppers were home grown. Dr. A. W. Morrill reported that a large number of peppers were shipped annually to the United States from the districts of Zacatecas and San Luis Potosi, Mexico, and he had collected the weevil at Tlahualilo, Durango, Mexico.



FIG. 10.—Pepper weevil (*Anthonomus xanthotinctus*): Adult. Much enlarged (after Hunter and Hinds).

FOOD PLANTS.

It is evident that the weevil does not breed in the wild or bird pepper, for these plants were examined thoroly at all the points visited as well as at Victoria, Tex. The bell or sweet pepper (Pl. II, figs. 4–6), chilli (Pl. II, figs. 1–3), and tabasco peppers of several varieties are always affected wherever the weevil occurs.

NATURAL ENEMIES.

As in the case of the boll weevil (*Anthonomus grandis* Boh.), altho a few parasites were reared, these did not occur in sufficient numbers to keep the insect in check. Mr. J. C. Crawford has identified the parasitic species as *Bracon mellitor* Say, and *Catolaccus incertus* Ashm. A small ant, *Solenopsis geminata* Fab.,^a was noticed to be actively engaged in removing larvæ and pupæ from the pods which had weevil exit holes in them, but in no case did the ants make an entrance themselves.

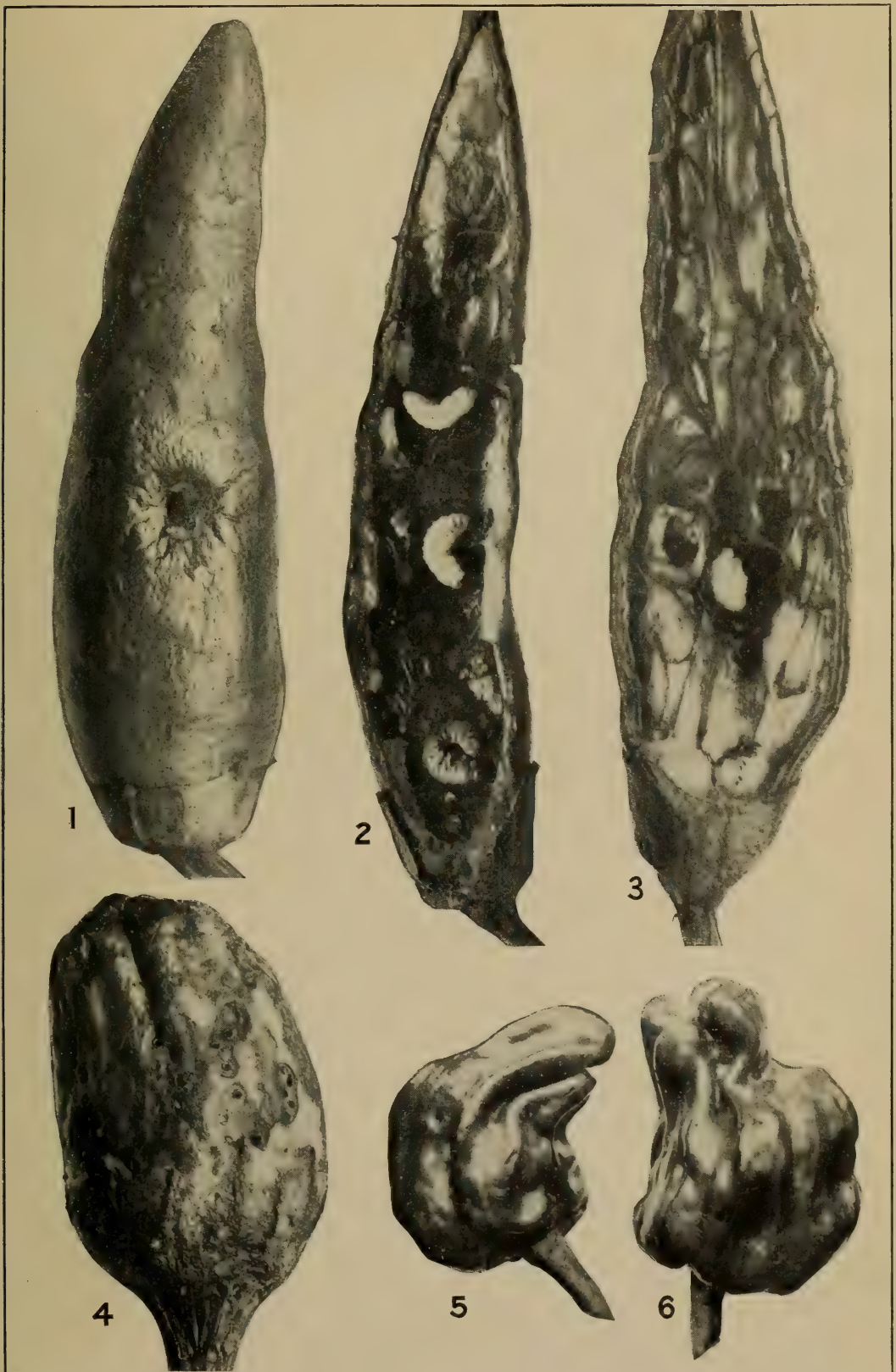
In the parasite breeding cages thousands of small mites were observed by Mr. W. W. Yothers, who reported that their presence in no way incommoded the weevils.

To determine the average number of weevils that may infest the chilli peppers, several experiments were tried, with the following results:

Experiment No.	Number of pods.	Number of weevils emerged.	Period covered.
1.....	80	86	Oct. 18–Nov. 4.
2.....	230	156	Do.
3.....	200	143	Oct. 18–Nov. 11.
4.....	100	123	Oct. 18–Oct. 31.
Total ..	610	508	

Thus it will be noticed that an average of nearly one adult to each pod was bred.

^aSee Bul. 63, Pt. III, Bur. Ent., U. S. Dept. Agric. An Ant Enemy of the Cotton Boll Weevil. By W. E. Hinds.



WORK OF THE PEPPER WEEVIL (*ANTHONOMUS ÆNEOTINCTUS* CHAMP.).

Fig. 1.—Emergence holes of adult in chilli pepper. Fig. 2.—Full-grown larva *in situ* in chilli pepper. Fig. 3.—Pupæ in cells in chilli pepper. Fig. 4.—Undeveloped bell pepper pod, showing numerous egg and feeding punctures. Figs. 5, 6.—Malformed bell pepper pods, caused by egg punctures. Figs. 1-3 three times natural size; fig. 4 twice natural size; figs. 5, 6 one-half natural size. (Original.)

The maximum numbers of individuals found in two pods were as follows:

Pod.	Adults.	Pupæ.	Larvæ.	Total.
1...	2	5	2	9
2.....		5	6	11

Many pods showed six egg punctures, from which five larvæ, in one instance, developed. It was also noticed that in nearly every case where egg insertion was made beyond the middle of the pod the larva was to be found slightly back of the puncture, but where the egg was deposited between the stem and middle of the pod the larva was located immediately underneath. The average number of egg punctures to a pod proved to be about two and one-third.

PROLIFERATION.^a

Proliferation was noticed in pods purchased in market at San Antonio, Tex., October 6, 1905, and the following two series of experiments were conducted by Dr. W. E. Hinds and Mr. W. W. Yothers:

Experiments to determine the effects on the pepper weevil of proliferation in the pepper pods.

FIRST SERIES.

Date.	Number of pods examined.		Pods with proliferation.										Pods without proliferation.									Feeding punctures.	
			Number.	Per cent of total.	Stages alive.					Stages dead.					Number.	Per cent of total.	Stages alive.			Stages dead.			
					Eggs.	Larvæ.	Pupæ.	Adults present.	Adults escaped.	Larvæ.	Pupæ.	Adults.	Per cent of stages.	Larvæ.			Pupæ.	Adults.	Larvæ.	Pupæ.	Per cent dead.		
Oct. 17..	100	41	41.0	0	18	25	8	6	1+	1 par.	0	3.4	59	59.0	20	22	24	7	2	12	26	47	
Oct. 31..	19	4	21.1	0	3	0	1	0	0	0	0	0.0	15	78.9	7	0	0	0	0	0.0	12	27	
	119	45	37.8	0	21	25	9	6	2	0	0	3.2	74	62.2	27	22	24	7	2	11.0	38	74	

SECOND SERIES.

Oct. 14..	12	11	91.7	0	13	10	9	6	1	0	1	5.0	1	8.3	0	0	0	0	0	0	0	3	45
Do...	120	111	92.5	0	125	102	19	34	1	1	0	0.7	9	7.5	2	0	0	0	0	0	0	(c)	(c)
Oct. 31..	21	21	100.0	1	55	34	10	1	1	0	0	0.0	0	0	0	0	0	0	0	0	0	155	9
	153	143	93.5	1	193	146	38	41	3	1	1	1.2	10	6.5	2	0	0	0	0	0	0	.....	

^a See also Bul. 59, Bur. Ent., U. S. Dept. Agric., p. 38, 1906.

^b This is a record of the proliferated areas on inside of pods and is a minimum.—W. E. H.

^c Not recorded.

REMEDIES.

In addition to the usual gathering and destroying of fallen pepper pods, cultural experiments were conducted in the following manner: Some pods were buried in boxes under 1, 2, and 3 inches of soil respectively, keeping one series dry and the other moist—conditions which would result necessarily from irrigation. In the former series the pods dried up and in the latter the pods rotted.

Experiments to determine the effect upon the pepper weevil of covering fallen infested pods with soil.

Num-ber of pods.	Number of punc-tures.	Depth of soil.	Condi-tion of soil.	Period covered.	Number of weevils emerging Oct. 19–Nov. 4.	Number of weevils found dead in soil Nov. 17.
25	62	Inches. 1	Wet	Oct. 19–Nov. 14 ...	1 adult; 1 parasite.	6 adults.
25	61	1	Dry	do	9 adults.....	12 adults.
25	56	2	Wet	do	4 adults ^a	1 adult.
25	60	2	Dry	do	3 adults.....	5 adults.
50	115	3	do	do	15 adults.....	14 adults.

^aThree of these weevils died as soon as they came thru the soil.

Thus it will be readily seen that the covering of the fallen pods every two to three weeks with from 1 to 3 inches of soil would be advantageous. This could be arranged by bedding high and then lowering the soil. Where irrigation is practised the decay of the pods is greatly hastened, thus depriving the larvæ of this food supply. It is only fair to state that at the time the pods in these experiments were buried most of the larvæ were nearly full fed, consequently a larger number came to maturity than would have been the case had burial occurred while the larvæ were small. Two other experiments were conducted by Mr. W. W. Yothers in large cages in the open, with the following results:

Experiments to determine the effect upon the pepper weevil of covering fallen infested pods with soil.

Number of pods.	Depth of soil.	Condition of soil.	Date of exami-nation.	Number of weevils emerged.	Number of weevils dead in soil Nov. 15.
500	Inches. 3	Dry ^a	Oct. 20	64	None found.
450	2	Dry ^a	Oct. 28	50	Do.

^a Heavy rains October 24 and November 10.

October 31 about 200 of the last-mentioned lot of pods were examined and found to contain 73 living and 9 dead stages; of this number 47 were pupæ and 15 were larvæ. The latter necessarily would have starved, owing to the rapid decay of the buried pods.

PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

THE STRAWBERRY WEEVIL IN THE SOUTH-CENTRAL STATES IN 1905.

(*Anthonomus signatus* Say.)

By A. W. MORRILL,
Special Field Agent.

For some time the Bureau of Entomology has been experimenting along the line of inducing parasites of related native species of weevils to prey upon the cotton boll weevil (*Anthonomus grandis* Boh.). One of the commonest and most parasitized of such weevils is the strawberry weevil (*Anthonomus signatus* Say). It was consequently important to ascertain whether this insect occurred in or near the infested regions of Texas and Louisiana and to what extent it was controlled by parasites.

In connection with this work, during the month of April, 1905, advantage was taken of an opportunity to observe the occurrence and injury of the strawberry weevil in the leading strawberry-producing sections of Texas, Louisiana, and Arkansas. Examinations were made in all cases in the blooming season when the insects would, if present, occur in their greatest abundance. In consideration of the destructiveness of this species in the strawberry fields of Maryland and North Carolina during the past few years, the data concerning its occurrence and nonoccurrence in the important strawberry-growing sections of other States are deemed of sufficient importance to be recorded.

THE STRAWBERRY WEEVIL IN TEXAS.

According to the latest available statistics (1899),^a more than four-fifths of the strawberries produced in the State of Texas are grown in two limited areas comprizing three counties. Of these sections the

^a Twelfth Census of the United States, 1900.

one ranking first in importance includes Brazoria and Galveston counties—two adjoining coast counties near the southeastern corner of the State. In this section examinations were made on April 7 and 8 at Alvin and Galveston, respectively, but without finding any indications of the presence of the strawberry weevil. The second largest strawberry-growing section of Texas is included in Smith County, near the northeastern corner of the State. An examination was made at Tyler, near the center of this section, on April 13, and again on April 28. On the first of these dates a single adult specimen was taken, and on the second occasion two adult specimens. In a total of about three hours spent near Tyler in fields of strawberries, blackberries, and dewberries, searching for these weevils and for evidence of their work, only the three adults and less than fifty injured buds were found.

The only published record known to the writer of the strawberry weevil's occurrence in Texas was by Dr. F. H. Chittenden,^a who reported injury by this species, in 1897, to blackberries and dewberries near Denison, in Grayson County, in the north-central section of the State. The fruit farms of the two correspondents who reported serious losses in that year were visited by the writer on April 21, 1905, and examinations made in fields of strawberries, blackberries, and dewberries. One of the owners reported that the weevils had been scarcely noticeable since April, 1897, when they were very destructive and so abundant that on sunshiny days they seemed to fairly swarm on the foliage of the food plants. This encouraging report concerning its scarcity in recent years gives ground for the hope that conditions in northern Texas will as a rule be unfavorable for this pest, altho a certain degree of intermittence in abundance during a series of years has been generally observed in other localities.

THE STRAWBERRY WEEVIL IN LOUISIANA.

In 1899, as shown by the Census report,^b 90 per cent of the strawberries produced in this State were grown in Tangipahoa Parish. This parish is located a short distance northwest of New Orleans. Hammond, one of the two leading shipping points in the parish, was visited on April 11. Examinations in strawberry fields and of wild blackberry bushes along the roadsides, in a downpour of rain, resulted in finding no evidence of the presence of the strawberry weevil near this place. As the day was so far from an ideal one for finding adults of this species, the only significant point is the failure to find a single flower bud injured in a manner to cause their presence to be suspected.

^a Bul. 10, n. s., Div. Ent., U. S. Dept. Agric., pp 82-83.

^b Twelfth Census of the United States, 1900.

THE STRAWBERRY WEEVIL IN ARKANSAS.

The strawberry-growing industry in Arkansas is a very important one, in 1899 the production of this State being nearly four times that of Texas and Louisiana combined; or, in round numbers, nearly 13,000,000 quarts. Three sections of the State were visited, including the two leading strawberry-growing districts which together produce more than four-fifths of all the strawberries grown in the State.^a The first in importance of these sections comprizes three adjoining counties in the northwest corner of the State—Benton, Washington, and Crawford. Van Buren, located in Crawford County, the southernmost of the three named, was visited on April 27. A single adult specimen of the strawberry weevil was taken on a wild blackberry growing by the roadside, but in the strawberry fields the only indications of its presence which were found were a few scattering severed flower buds. The second section in importance in strawberry production in Arkansas is located in White County, which is situated a short distance northeast of the geographical center of the State. This county in 1899^a produced one and a half million quarts of strawberries, or a quantity a little short of equaling the total production of the State of Louisiana. Bald Knob and Judsonia, two leading strawberry shipping points in Smith County, were visited on April 25. Many strawberry fields were visited, and the weevil was found to be moderately abundant near these localities. The destruction in the many fields examined was estimated to range from 5 to 25 per cent of the flower buds, averaging between 10 and 15 per cent. Along the roadsides a small percentage of the flower buds of wild blackberries had been wholly or partially severed. The weevil and its destructive habits were found to be fairly well known among the strawberry growers in this section, by whom the weevil was reported to have varied in abundance from year to year, and in occasional years in the past to have accomplished considerable damage. The destruction of the flower buds, as mentioned above, did not necessarily represent a proportionate loss to the growers, as picking had begun about ten days earlier, and berries produced from flowers which set at a later date than the writer's examination very likely would remain unpicked owing to the expected falling off in the market demands. The third locality in Arkansas where an examination was made is near the center of the State, 1 mile from Little Rock. An hour's search in a strawberry field on April 26 revealed a few severed buds, while not a hundred yards away wild blackberries, which were very common along the roadsides, had from 5 to 10 per cent of their flower buds destroyed. The only adult specimen of the strawberry weevil taken in this vicinity was on a blackberry bush.

^aTwelfth Census of the United States, 1900.

VARIETIES OF STRAWBERRIES GROWN.

At Alvin, Tex., the favorite variety among the strawberry growers is the Klondike, while at the other localities mentioned individual preference seems to be divided between the Lady Thompson, Michel, and Excelsior varieties. In the section of the country to which these notes refer, the writer has never met any strawberry growers who use any but bisexual varieties. Arkansas growers, who probably suffer more or less loss every year from the strawberry weevil, should be encouraged to introduce suitable early pistillate varieties, as the insect in that State threatens to cause, occasionally at least, considerable destruction.

PAPERS ON THE COTTON BOLL WEEVIL AND RELATED AND ASSOCIATED INSECTS.

THE COTTON STALK-BORER.

(*Ataxia crypta* Say.)

By A. C. MORGAN,
Special Field Agent.

During October, 1905, while inspecting cotton fields in the vicinity of Yoakum, Tex., the writer's attention was attracted by the great number of dead stalks. Examination showed that these stalks contained larvæ, pupæ, and adults of the cotton stalk-borer (*Ataxia crypta* Say).

DISTRIBUTION.

The specimen which Say described in 1832 as *Lamia crypta* came from Louisiana. Haldeman's specimen, described as *A. sordida*, came from Alabama. Leng and Hamilton recorded the species from Pennsylvania, Alabama, Louisiana, Texas, and New Mexico. In *Biologia Centrali-Americana* its habitat is extended to Almolonga, Mexico. It has been reported to the Department from Tucson, Ariz.; New Orleans, La.; Savannah, Ga.; Grant, Fla.; and Round Mountain, San Diego, Beeville, Bexar, Edgar, Flatonia, and Dallas, Tex. During 1905 the writer found it in Texas at Yoakum, Sublime, Corpus Christi, Cotulla, Alice, and Victoria. During February and March of 1906, Mr. W. W. Yothers collected hibernating adults from cotton bolls at Athens, Brenham, Navasota, and Calvert, Tex., and on March 1, 1906, the writer also obtained specimens from bolls at Flatonia, same State.

HOST PLANTS.

The cotton stalk-borer attacks a number of plants. At Tucson, Ariz., it was reported on *Helianthus* and *Xanthium*. At Savannah, Ga.; New Orleans, La., and Round Mountain, Tex., larvæ have been found boring in the twigs and trunk of the fig. Mr. E. A. Schwarz informs the writer that it has been bred frequently from the stem of *Ambrosia*, and one report of the borer in this plant was received by

the Department from Edgar, Tex. On March 1, 1906, the writer found larvæ in the stems of *Ambrosia* and *Helianthus* at Flatonia, Tex. It has been reported breeding in cotton from Bexar and San Diego, Tex., and the writer found it in October, 1905, breeding in this plant at Yoakum, Sublime, and Victoria, and in November at Alice, Tex. The adult has been reported from peach and apricot, but there are no records to show that it injures either of these plants. Leng and Hamilton state that specimens were found boring in dry twigs of box elder (*Acer negundo*) and hackberry.

LIFE HISTORY.

Very little work has been done upon the life history of this species. The egg is laid upon the host plant and the larva upon hatching bores into the bark or wood of the plant, where it feeds until full grown, pupates, and finally, when adult, cuts its way out. The winter is very probably past in any of the three stages of larva, pupa, or adult, for it has been reported by Mr. E. A. Schwarz as emerging in May, 1897, from a stalk of cotton cut in December, 1896. In October, 1905, the writer found the insect in cotton stalks in all stages of development from the very small larva to the adult ready to emerge from the stalk.

In southwest Texas, where the winters are very mild, it is very likely that development proceeds slowly all winter long, except in the most severe winters, when it would probably cease for a few weeks.

INJURY AND ECONOMIC IMPORTANCE.

Rarely has the cotton stalk-borer been reported, and in no case has serious damage been ascribed to it. Altho it was described by Say as early as 1832, no mention is made of it in economic literature until 1896, and since that time only five short notes have been made, all of which are apparently based upon Dr. L. O. Howard's first published notice in 1896, which reads as follows:

There is but one borer in the stalks of cotton, and that is the long-horned beetle known as *Ataxia crypta* (Say). It is occasionally mistaken for an enemy of the plant, but investigation has shown that it lays its eggs upon, and its larvæ bore into, only such stalks as have been damaged by some other cause, such as rust. It follows injury to the plant rather than causes it.

The rather general occurrence of this insect at Yoakum, Tex., in 1905 has made it seem advisable to publish this more extended note. Twenty-six fields were examined in this locality, and showed that from 5 to 10 per cent of the stalks were infested by this insect. One field had 20 to 25 per cent of its stalks injured by the borer. It is to be regretted that the discovery of this infested locality was not made earlier in the season, so that a more conclusive study could have been made.

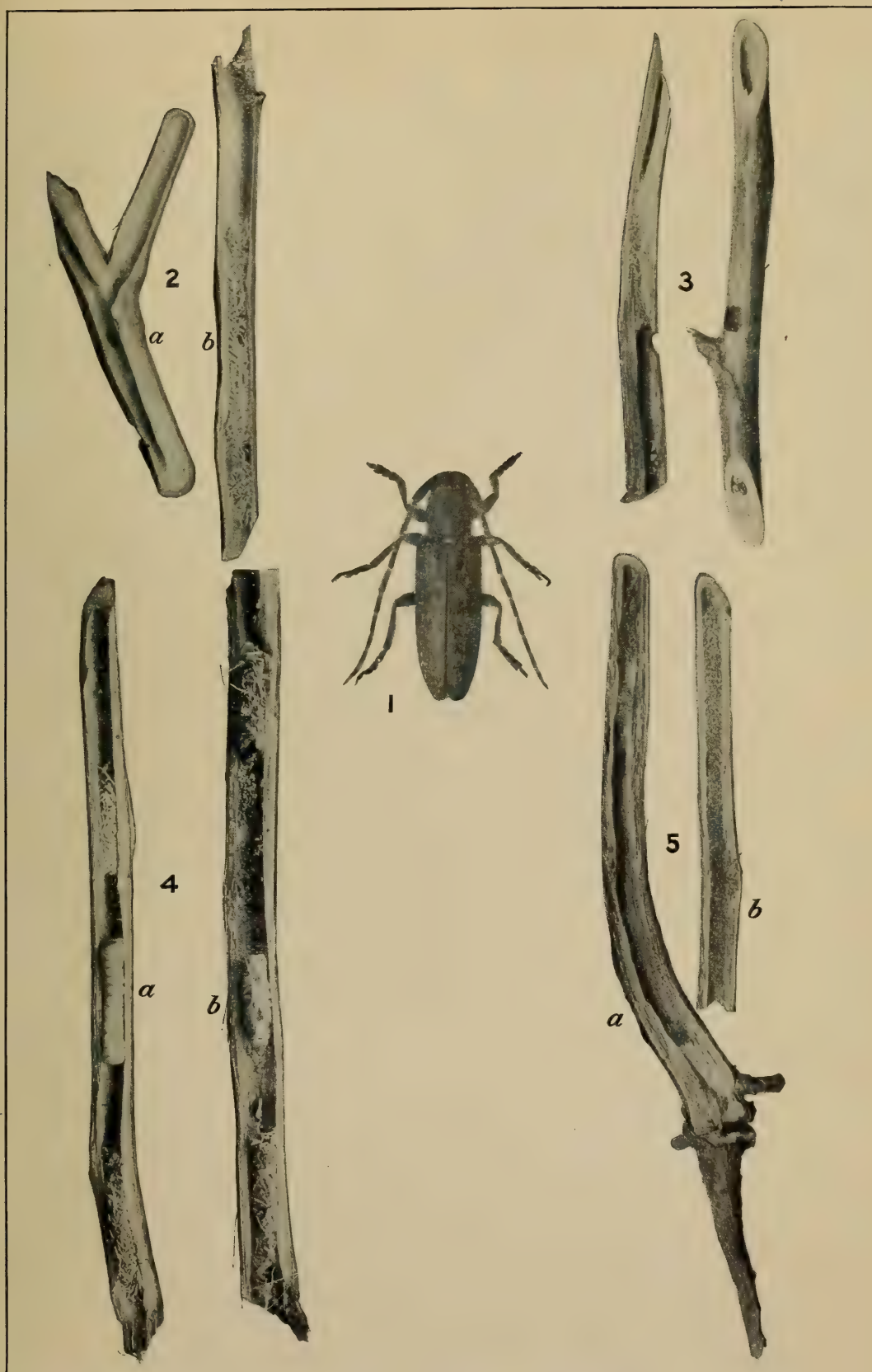
THE COTTON STALK-BORER (*ATAXIA CRYPTA*).

Fig. 1.—Adult or beetle. Fig. 2.—*a*, Galleries; *b*, work. Fig. 3.—Emergence holes of adults. Fig. 4.—*a*, Larva *in situ*; *b*, pupa *in situ*. Fig. 5.—*a*, Gallery running into root of plant; *b*, castings behind larva. Fig. 1 twice natural size; figs. 2-5 two-thirds natural size. (Original.)

As has been stated by Doctor Howard, it is the larva of the borer that works in the cotton stalk. It confines its attack to the pith of the plant. The amount of injury depends upon the size of the plant and the number of borers. The writer found one plant about 3 feet high at Yoakum which contained eight larvæ, and which showed four emergence holes. The twelve borers had eaten out all the pith from the smallest branches to 3 inches below the surface of the ground in the tap-root. The small twigs were only thin shells and crumpled like paper between the fingers.

Nearly all infested plants showed unmistakable evidence of previous injury, yet the comparatively fresh and healthy condition of a few stalks points to the probability of an occasional attack upon perfectly healthy stalks. In the field showing an infestation of 20 to 25 per cent of its stalks it was estimated that the injured stalks had borne at least 80 per cent as much cotton to a stalk as had the uninjured ones. If it is true that the borer attacks only such stalks as are diseased or otherwise injured, then only a little damage can be attributed to it; yet the borer's attack, added to the injury due to disease, must hasten the death of the plant and thereby lessen the number of bolls to mature.

NATURAL ENEMIES.

From material collected at Yoakum, Tex., on October 28 two parasites of *Ataxia crypta* were bred. One, *Heterospilus websteri* Ashm., had entirely covered the pupa of *A. crypta* with its cocoons. In the majority of cases, however, this parasite had spun its cocoon after crawling away from the body of its host. Several masses of these cocoons were found with no trace of either the larva or pupa of *A. crypta* visible, and in one instance the larvæ of this parasite were found in a hollow cotton stalk and no form of *A. crypta* near. The second parasite belongs to the genus *Etroxys* and is a new species. There is some doubt that this species is a parasite upon *Ataxia*, but since it is parasitic upon beetles and its pupæ were found in a stalk bored out by *A. crypta*, it is here placed on record as a parasite of the latter.

REMEDY.

If at any time the injury by the insect should become serious the numbers of the borer can be easily reduced by destroying the infested stalks early in the fall. The time of destruction must, of course, vary in different localities, but it should be as early in October as possible for the latitude of Yoakum. By October 28 not more than 10 per cent. of the borers had emerged. If the stalks had been destroyed early in October very few borers would have escaped. To obtain the best results, stalks should not be cut but plowed out, for many of the

borers go 2 or 3 inches below the surface of the ground in the tap-root and pupate there. In regions infested by the boll weevil, if the farmers would follow the directions given by this Bureau for the destruction of stalks, the cotton stalk-borer would not appear. In regions uninfested by the boll weevil but infested by the cotton stalk-borer, an occasional examination of infested areas for the emergence holes of the borer or an examination of the stages in the stalk—which can be made by splitting the stalk with a knife—will show the planter when to begin plowing and burning.

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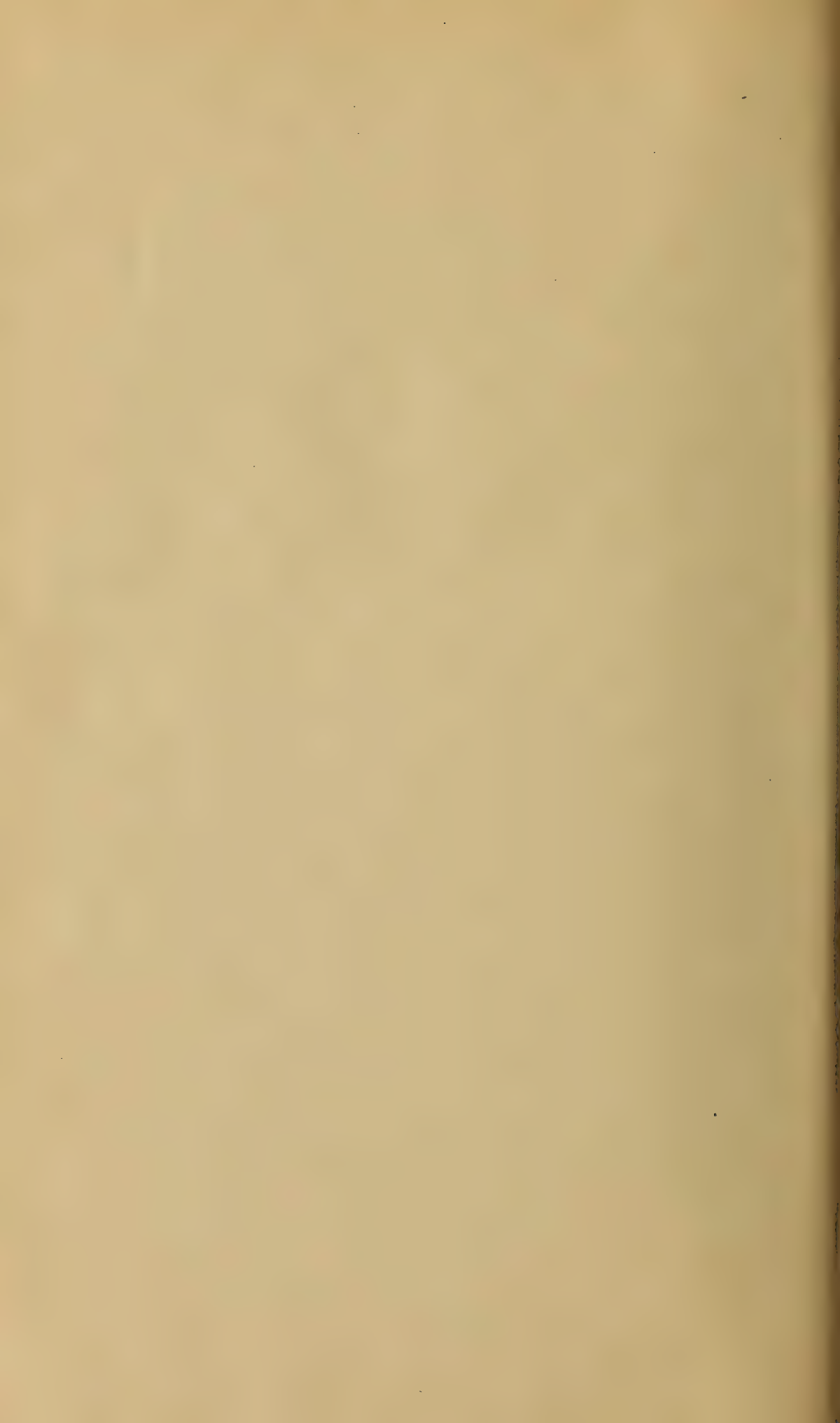
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